4. Net sampling: Krill and zooplankton; submitted by Valerie Loeb (Legs I & II), Emma Bredesen (Legs I & II), Michael Force (Legs I & II), Nancy Gong (Legs I & II), Adam Jenkins (Legs I & II), Lorena Linacre (Legs I & II), Shelly Peters (Legs I & II), and Rob Rowley (Legs I & II).

4.1 Objectives: Here we provide information on the demographic structure of Antarctic krill (*Euphausia superba*) and abundance and distribution of salps and other zooplankton taxa in the vicinity of Elephant, King George and Livingston Islands. Essential krill demographic information includes length, sex ratio, maturity stage composition and reproductive condition. Information useful for determining the relationships between krill and zooplankton distribution patterns and ambient environmental conditions was derived from net samples taken at established CTD/phytoplankton stations. The salp, *Salpa thompsoni*, and copepod species receive special attention because their interannual abundance variations may reveal underlying hydrographic processes influencing the Antarctic Peninsula ecosystem. Results are compared to those from previous AMLR surveys to assess between-year differences in krill demography and zooplankton composition and abundance over the 1992-2002 period. Additional historical data from the Elephant Island Area are used to examine copepod species abundance and abundance relations between 1981 and present.

4.2 Accomplishments:

4.2.1 Large-Area Survey Samples:

Krill and zooplankton were obtained from a 6' Isaacs-Kidd Midwater Trawl (IKMT) fitted with a 505μm mesh plankton net. Flow volumes were measured using a calibrated General Oceanics flow meter mounted on the frame in front of the net. All tows were fished obliquely from a depth of 170m or to ca. 10m above bottom in shallower waters. Real-time tow depths were derived from a depth recorder mounted on the trawl bridle. Tow speeds were ca. 2kts. Samples were collected at Large-Area survey stations during both cruise legs. Four regionally distinct groups of stations are considered (See Figure 2 in Introduction; Figures 4.1A & B). Elephant Island Area stations represent the historically sampled area used for long-term analyses of the Antarctic Peninsula marine ecosystem. West Area stations, north of King George and Livingston Islands, form a database with which to examine the abundance and length composition of krill stocks available to predator populations at Cape Shirreff and to the krill fishery that operates in this area during summer months. Within Bransfield Strait the South Area stations are used to monitor krill supplies available to predator populations in Admiralty Bay, King George Island, while the Joinville Island Area stations, to the east, are sampled to determine whether significant aggregations of juvenile krill occur there in association with Weddell Sea influence.

4.2.2 Shipboard Analyses:

All samples were processed on board. Krill demographic analyses were made using fresh or freshly frozen specimens. Other zooplankton analyses were made using fresh material within two hours of sample collection. Abundance estimates of krill, salps, and other taxa are expressed

as numbers 1,000m^{-3} water filtered. Abundance information is presented for the Elephant Island, West, South and Joinville Island Areas, and for the total survey area.
(A) Krill. Krill were removed and counted prior to other sample processing. All krill from samples containing <150 individuals were analyzed. For larger samples, generally 100-200 individuals were measured, sexed, and staged. Measurements were made of total length (mm); stages were based on the classification scheme of Makarov and Denys (1981).

(B) Salps. All salps were removed from samples of 2L or less and enumerated. For larger catches, the numbers of salps in 1 to 2L subsamples were used to estimate abundance. For samples with $\leq$100 individuals, the two life stages (aggregate/sexual and solitary/asexual) were enumerated and internal body length (Foxton, 1966) was measured to the nearest millimeter. Representative subsamples of $\geq$100 individuals were analyzed in the same manner for larger catches.

(C) Fish. All adult myctophids were removed, identified, measured to the nearest millimeter Standard Length, and frozen.

(D) Zooplankton. After krill, salps, and adult fish were removed the remaining zooplankton fraction was analyzed. All of the larger organisms (e.g., other postlarval euphausiids, amphipods, pteropods, polychaetes) were sorted, identified to species if possible, and enumerated. Following this the samples were aliquoted and smaller zooplankton (e.g., copepods, chaetognaths, euphausiid larvae) in three or four subsamples were enumerated and identified to species if possible using dissecting microscopes. After analysis the zooplankton samples (without salps and adult fish) were preserved in 10% buffered formalin for long term storage.

With the expanded survey grid this year came the introduction of higher latitude zooplankton taxa that previously had not been encountered. This was especially true in the Joinville Island Area, influenced by Weddell Sea shelf water, and South Area adjacent to, and influenced by, outflow from Gerlache Strait. Implementation of a more protective cod-end also increased the numbers of previously unidentifiable delicate taxa. Notable additions to the faunal assemblage were abundant larval and juvenile fishes (e.g., *Trematomus newnesi, T. scotti, T. lepidorhinus, Prionodraco evansii, Parachaenichthys charcoti*), tentatively identified jellies (e.g., *Zanclonia weldoni, Modeeria rotunda, Chromatonema rubra*), pteropods (*Clio pyramidata sulcata, C.p. antarctica* and *C.p. mertensi*), unidentified decapod larvae and "ice krill", *Euphausia crystallorophorias.*

While identification tools at hand permitted us to name many of the new taxa, large concentrations of euphausiid larvae (primarily late calyptopis and early furcilia), particularly in the Joinville Island Area during Leg I, created concerns. These *Euphausia* spp. larvae potentially were *E. crystallorophorias*, the dominant euphausiid in higher latitude pack-ice zones. Antarctic krill and "ice krill" have similar spawning periods (December to February). During prior AMLR surveys, postlarval *E. crystallorophorias* were rarely collected and larvae never identified. Because *E. superba* and *E. crystallorophorias* larvae are similar in size and appearance there is no assurance that they were adequately separated during Survey A (Leg I) sample analyses. This is a serious matter as projections about krill year-class success are in part based on their larval abundance during January-March surveys. An additional sample from known spawning grounds of *E. crystallorophias* was therefore required to establish larval identification aids for these species. This sample, collected in Bismarck Strait (Antarctic Peninsula) after Survey A, allowed us to focus upon species identifications of freshly caught euphausiid larvae based on pigmentation and morphometrics. Information derived from this exercise was extremely useful during Survey D (Leg II) when larval identifications were made for *E. frigida* and *E. triacantha,* previously lumped as *Euphausia* spp., as well as *E. crystallorophias.*

4.2.3 Statistical Analyses:

Data from the total survey area and four subareas are analyzed here for between-cruise and between-year comparisons. Analyses include a variety of parametric and nonparametric techniques. Among these are Analysis of Variance (ANOVA), Cluster Analysis, Percent Similarity Indices (PSIs) and Kolmogorov-Smirnov cumulative percent curve comparisons (D_{max}). Cluster analyses use Euclidean distance and Ward's linkage method; clusters are distinguished by a distance of 0.40 to 0.60. Clusters based on size characteristics utilize proportional length frequency distributions in each sample with at least 17 krill or 50 salps. Zooplankton clusters are based on log transformed sample abundance data for the most frequently occurring taxa. Statistical analyses were performed using Statistica software (StatSoft).

4.3 Results and Preliminary Conclusions:

4.3.1 Survey A, January-February 2002

4.3.1.1 Krill:

Frequency and Abundance (Table 4.1A, Figure 4.1A)

Postlarval krill were present in 71 of 95 survey samples (75%). They were most frequent in the Elephant Island Area where they occurred in all but five of 44 samples (89%); catch frequency ranged from 60-67% in other areas. The largest catch, from the South Area, contained nearly 4,000 individuals (1,477 krill per 1,000 m^3). Other large catches (i.e., >1,000 krill, estimated 400-700 per 1,000 m^3) were taken in all areas. Large concentrations were located over or offshore of shelves north of Livingston and King George Islands (Drake Passage), north of Joinville Island (Bransfield Strait) and northeast of Elephant Island Area. Krill abundance and distribution attributes varied regionally. Highest mean abundance in the South Area (161.7 per 1,000 m^3) resulted from three large catches, however, the large standard deviation and low median value (0.8 per 1,000 m^3) reflect generally sparse catches in this area. Mean abundance in the Elephant Island Area was comparatively low (39 per 1,000 m^3), but a relatively large median (7.5 per 1,000 m^3) and small standard deviation result from more uniform (i.e., less patchy) distribution. Moderately high concentrations characterized three of 9 Joinville Island Area samples and resulted in overall high mean and median values (respectively, 78.3 and 10.3 per 1,000 m^3). The West Area was characterized by patchy and generally low krill concentrations (mean and median, 42.0 and 0.4 per 1,000 m^3). Abundance differences among the four areas were not significant (ANOVA, P>>0.05 in all cases).

Length and Maturity Stage Composition (Table 4.2; Figures 4.2A & B; 4.3A-D; 4.4A-D)

Krill ≤33mm and ≥50mm, respectively, comprised 75% and 5% of the total catch. Accordingly, the maturity stage composition was 72% juvenile, 11% immature and 17% mature stages. South and Joinville Island Area krill were almost exclusively ≤38mm in length; size distributions centered around 24-25mm modes with a 26mm median and 90% ≤32mm. Juveniles representing the 2000/01 year class constituted 88-93% of individuals. Broader size ranges (16-60mm) and more heterogeneous length-maturity stage compositions were represented to the north, particularly in the West Area. Length distributions in the West Area were polymodal with peaks around 22, 25, 31, 36 and 53-55mm. This uneven pattern most likely results from extreme patchiness. While the primary mode was 25mm, the median (31mm) was 5mm larger than in the South and Joinville Island Areas and 15% of krill were ≥50mm. Accordingly, 57% were juveniles, 17% immature and 26% mature stages. Reproductively mature males (M3b) constituted 6% and females (F3a-3e) 20% of the total; 84% of these females were in advanced stages, predominantly gravid (F3d). Small juveniles also dominated Elephant Island Area catches (46%) but here 20-30mm lengths were equally represented with no obvious mode. This latter observation suggests successful recruitment from an extended spawning season the previous year. Larger krill centered about a 41-42mm mode and 20% of individuals were >45mm (i.e., ≥4 years old; Siegel, 1987). Immature and mature stages comprised 9% and 45%, respectively. Females outnumbered males by 60%; reproductively mature males comprised 10% and females 30% of the total. Most of these females (92%) were in advanced stages. Relatively large proportions of the Elephant Island population were gravid (10%) and spent (6%) females indicating active spawning in the area.

Distribution Patterns (Figures 4.5A; 4.6A & B)

Cluster analysis applied to length distributions in samples with ≥24 krill yielded three groups. Cluster 1 was represented at 13 stations primarily in the southeast portions of Bransfield Strait and Elephant Island Area. These were mostly 1 year-old krill: 90% were ≤33mm with 24-25mm modal length; juveniles comprised 89% and immatures 7% of the total. Cluster 2 occurred at 16 stations; although these were primarily over the South Shetland Island northern shelves and offshore of the Elephant Island shelf three were located in south and east Bransfield Strait. Lengths ranged from 18-59mm but centered around a 41-42mm (3 year-old) mode. Juveniles made up 16% and immature stages 26% of the total. Mature females outnumbered males; 16% had developing ovaries (F3c), 14% were gravid (F3d) and 6% spent (F3e). Cluster 3 was limited to seven Drake Passage stations and comprised predominantly (84%) large, mature individuals. Lengths were centered around 50 and 53mm modes, with a 49mm median, and represented 4 year-old (1997/98 year class) and older krill. Males and females were equally represented and actively reproductive: 43% stage 3b males; females with developing ovaries (12%), gravid (24%) and spent (2%).

4.3.1.2 ***Salpa thompsoni:***

Frequency and Abundance (Table 4.1A; Figure 4.7A)

This ubiquitous salp was present in 88% of samples. It was most and least frequent in the West (96%) and Joinville Island (56%) Areas. Overall mean and median abundance values were relatively high (268 and 70 per 1,000 m^3, respectively); they were greatest in the Elephant Island (410 and 86 per 1,000 m^3) and South (201 and 71 per 1,000 m^3) Areas and lowest in the Joinville Island Area (184 and 2 per 1,000 m^3). Abundance differences are not significant due to large catch variability (i.e., large standard deviations) within each area (ANOVA, $P>0.05$).

<u>Composition, Size and Distribution (Figure 4.8)</u>

Aggregate (chain) forms constituted 98% of the overall catch and 97-100% in all but the West Area where solitaries comprised 8.5%. Solitaries were represented by a broad (4-120+mm) polymodal size range; median length was 38mm and 80% of individuals were <6 mm. Large, reproductively mature solitaries characterized the West and Elephant Island Areas where median lengths were 30 and 45mm, respectively. Median solitary lengths in the South and Joinville Island Areas were 5-6mm. While largest aggregates had 89-90mm internal lengths, the continuous size range extended from 4-74mm. Presence of extremely large aggregates indicate a particularly early onset of seasonal chain production (e.g., early August 2001, assuming a 0.44mm per day growth rate). Median aggregate lengths for the South, Elephant and Joinville Island Areas were 25-29mm suggesting a late November-early December production peak. Median aggregate length in the West Area was 43mm; overall length frequency distribution there was significantly larger than in the Elephant Island Area (Kolmogorov-Smirnov test, $P<0.05$). Peak production of these larger aggregates was probably a month earlier (i.e., in late October) than in other areas. Cluster analysis applied to lengths in all samples with >60 measured aggregates did not produce geographically coherent size groupings.

4.3.1.3 Zooplankton and Micronekton Assemblage:

<u>Overall Composition and Abundance (Tables 4.3, 4.4A, 4.5; Figures 4.9A & B, 4.10A & B)</u>

A total of 103 taxonomic categories (including 8 copepod species) were enumerated. Mean and median numbers of taxa per tow (19-20) were similar for the West, Elephant Island and South Areas; species richness within the Joinville Island Area was slightly higher (mean and median values 23 and 24 taxa per tow).

Copepods were present in all samples and comprised >67% of the catch. *Calanoides acutus* and *Calanus propinquus* were the most abundant taxa in all four areas and contributed 55% of total zooplankton. Greatest copepod abundance was in the West Area; significantly higher concentrations *C. acutus, Rhincalanus gigas, Pareuchaeta antarctica* and "other copepods" were located there than in other areas (ANOVA, $P<0.05$). Abundance of larval *Thysanoessa macrura* followed that of copepods overall and within West and Elephant Island Areas; West Area concentrations were significantly greater than in other areas (ANOVA, $P<0.01$ in all cases) and reflect their oceanic distribution. Aside from shared dominance by these taxa, zooplankton assemblages of the four areas differed. Mean and median abundance of ostracod and *Euphausia* spp. larvae ranked 2 and 3 in the Joinville Island Area. Within the South Area, postlarval *T. macrura, S. thompsoni* and krill respectively ranked 3, 4 and 5 in mean and median abundance. *Salpa thompsoni* ranked 3 and 4, respectively, in Elephant and Joinville Island Areas. The extremely high mean abundance value of radiolarians in the West Area gave them a rank of 3; based on medians, chaetognaths, the pteropod *Clio pyramidata sulcata* and amphipod *Themisto gaudichaudii* ranked 3, 4 and 5. Overall zooplankton abundance relations were most similar between West and Elephant Island Areas (PSI=79); those of the Joinville Island Area differed considerably from other areas (PSI=38-49). In addition to different abundance relations of dominant taxa, the Joinville Island Area included unidentified larval and postlarval decapods, crustacean larvae, various jellies and larval fish species many of which are associated with the Weddell Sea.

Larval krill were relatively rare; the 19.4 per 1,000 m^3 mean abundance value was similar to that of postlarval *E. frigida* and *E. crystallorophorias* (ranked 12-14 overall). Greatest concentrations were in the Elephant Island and South Areas (respective means of 35.8 and 13.3 per 1,000 m^3); they were quite sparse in the West Area (1.5 per 1,000 m^3 mean). Unlike previous years, there was no significant positive relationship between larval krill and total copepod abundance (Kendalls Tau, $P>0.05$). It is quite likely that the abundant *Euphausia* spp. larvae in the Joinville Island Area (985$\pm$248 and 69 per 1,000 m^3 mean, standard deviation and median, respectively) were krill. Larval krill stages ranged from early Calyptopis (C1) to early Furcilia (F2). Overall stage composition was: (C1) 37%; (C2) 16%; (C3) 17%; (F1) 10%; and (F2) 20%. Relatively large proportions of both Furcilia and C1 stages indicate an early and prolonged spawning season. Relative proportions of calyptopis and furcilia larvae differed in each area (Table 4.5): calyptopis stages comprised 100% in the West and 77% in the Elephant Island Areas; furcilia were 79% in the South Area. Larval *Euphausia* sp. in the Joinville Island Area were primarily C3 (52%) and F1 (38%).

Distribution Patterns (Table 4.6; Figure 4.11A)

Cluster analysis applied to abundance [Log (N+1)] of taxonomic categories (minus larval krill and *Euphausia* sp.) in $\geq$13% of samples resulted in three groups with more or less obvious hydrographic affiliations. Cluster 1 was present at 15 Drake Passage stations well offshore of the South Shetlands and Elephant Island, within Type 1 (or Water Zone I) "Oceanic" water. "Coastal" Cluster 3 occurred at 39 stations in predominantly Type 4 (Water Zone IV) and Type 5 (Water Zone V) waters within and downstream of Bransfield Strait. Cluster 2 was represented at 41 stations, generally over or adjacent to island shelves, characterized by mostly Type 2 (Water Zone II) and 3 (Water Zone III) waters. In addition to water zone affiliations, the distribution patterns reflected prevailing water transport and eddies seen in dynamic height plots (See Physical Oceanography section in this report). Notable among these are associations with regularly observed gyres offshore of King George Island and within the Joinville Island Area.

Overall zooplankton abundance in Oceanic Cluster 1 was an order of magnitude greater than in the other two clusters and, among the 12 dominant taxa, only that of *S. thompsoni* was not significantly higher (ANOVA, P generally <0.01). Shared dominance by, and abundance relations of, *C. acutus, C. propinquus, T. macrura* larvae, *M. gerlachei* and *R. gigas* resulted in similar overall compositions of Clusters 1 and 2 (PSI=80). Aside from overall and individual species abundance values Cluster 1 differed from Cluster 2 by having large numbers of radiolarians. Coastal Cluster 3 differed substantially from these (PSIs=48-50) due to more even abundance relations (i.e., less extreme dominance by a few taxa) and comparatively large proportions of postlarval *T. macrura, M. gerlachei* and *S. thompsoni*. Abundance of *T. macrura* and *S. thompsoni* were significantly higher than in Cluster 2 (ANOVA, $P<0.05$).

4.3.1.4 Survey A Between-Year Comparisons:

Krill (Tables 4.7, 4.8, 4.9)

Within the 1991/02-2001/02 Elephant Island Area data set January 2002 krill abundance values were relatively high; the mean ranked 2 and median 4 over the 11-year data set. These values were most similar to those of 1994 (mean and associated standard deviation) and 1993 (median). Modest abundance increases over 2001 resulted from recruitment of the 2000/01 year class which offset loss of older individuals, most notably remnants of the highly successful 1994/95 year class that has dominated catches for the past six years. Assuming that the Elephant Island Area is representative of the northwest Antarctic Peninsula region, the large proportion of juveniles (46%), second only to that of 1996 (55%), indicates substantial recruitment from last years spawn. Relatively small proportions of two year old intermediate sized (34-40mm) and immature forms (9%) here (as well as the other areas) support last year's observations of low 1999/00 year class success. Overall maturity structure was most similar to that of 1992 (PSI=90).

Although mean and median krill carbon biomass in the Elephant Island Area (219 and 38mg C per m^2) were similar in magnitude to values of January-February 1995-1997 and 2001 they both ranked among the lowest recorded over the seven years for which data are available. This reflects the shift in dominance from large mature stages to small juveniles.

The adult population was actively spawning during Survey A with >91% of mature females in advanced stages. This is comparable to the situation in 1994/95, 1995/96 and 1998/99 where 93-98% were in advanced stages. Mean larval krill abundance and maximum catch size were relatively high and similar 2000/01 values. However, these numbers are low compared to those of 1994/95 and 1998/99. Presence and relatively large proportions of furcilia stages have previously been noted only during Survey A in 1998 indicates a very early initiation of spawning (e.g., late November-early December) compared to other years.

Salps (Tables 4.7, 4.9; Figures 4.11F, 4.14)

Salpa thompsoni mean and median abundance values in the Elephant Island Area, like those of 1996/97, were moderate compared to extreme highs in 1992/93 and 1993/94 and lows in 1994/95 and 1995/96. The stage composition, with 98% aggregate forms, is typical for January-February surveys. The broad aggregate size range, median length and length-frequency distribution most resembled those of 1996/97. Accordingly, mean and median salp carbon biomass values (219 and 38mg per m^2) were most similar to those of 1996/97. The median salp:krill carbon biomass relation (3.4) was similar to the moderate value of 2000/01 (3.1).

Zooplankton Assemblage (Tables 4.5, 4.7, 4.10, 4.11A, 4.12A, 4.13)

Increased diversity over previous years can be attributed to (a) extended sampling areas, (b) a more protective cod-end, (c) refined identification techniques and (d) inclusion of more unidentified ("unid.") categories. Mean and median numbers of taxa per tow for the total survey, West and Elephant Island Areas (19-20) were similar to those of 2000/01 whereas the South Area value (19 taxa per tow) was substantially less (25 taxa per tow). Overall mean Survey A abundance of various taxa was highest recorded since 1994/95 and resulted from large concentrations within one or more areas: Copepods (notably *C. acutus* and *C. propinquus*), radiolarians and *Clione limacina* (West and Elephant Island Areas); *Clio p. sulcata* (West and Elephant Island Areas); *Primno macropa* and *E. frigida* (Elephant Island and South Areas); ostracods and larval *Lepidonotothen larseni* (Joinville Island and South Areas); and *E. crystallorophias* (South Area). Abundance of *Ihlea racovitzai* (predominantly in the Joinville Island Area) was low relative to 1997/98 and 1998/99 and similar to that of 2000/01.

Within the Elephant Island Area copepod abundance was the greatest observed over the 9-year period for which there are AMLR data. The mean >5X greater than peak values of January-February 1996, 1999 and 2001; the median was one to two orders of magnitude greater than previously observed. These values, more like seasonally elevated ones of February-March, were due to extremely large concentrations of *C. acutus* and *C. propinquus*, both of which are oceanic species. As during 1999, abundance of coastal *M. gerlachei* was low compared to other January-February surveys. Among other dominant taxa, mean and median abundance of larval *T. macrura*, postlarval *E. frigida* and chaetognaths were also the largest encountered during AMLR surveys. Extreme patchiness led to high mean abundance of postlarval *T. macrura*, but its median value ranked 5 out of 9. While mean larval krill abundance ranked third in the 7 years for which there are data it was only about 20% values of January-February 1995 and 1999. Calyptopis stages usually constitute the vast majority of larvae sampled during early summer; similar, relatively large proportions of furcilia stages (68%) were only noted during 1998 Survey A.

Numerical dominance of the zooplankton assemblage by copepods (76% of individuals) was the most extreme observed over the 9 year period. This dominance resulted in moderately high PSI values (71-77) in comparisons with January 1995, 1996, 1997 and 1999 and low values (14-15) in comparisons with 1994 and 1998 when salps were by far the dominant taxon. Rankings of the five most abundant taxa (copepods, larval and postlarval *T. macrura*, *S. thompsoni*, and chaetognaths) were most similar to those of January 2001.

4.3.2 Survey D, February-March 2002

4.3.2.1 Krill:

<u>Frequency and Abundance (Table 4.1B; Figure 4.1B)</u>

Postlarval krill were present in 54 of 94 Survey D samples (57%) and had overall mean and median abundance values of 281 and 0.5, respectively. The largest catch (ca. 22,000 individuals, 7,566 per 1,000 m^3) was in southwest Bransfield Strait, in proximity to the Gerlache Strait. Two other large catches (ca. 11,000 and 2,100 individuals, 7,323 and 9,319 per 1,000 m^3) were located inshore north of Livingston and King George Islands. Two moderately large concentrations (534-660 per 1,000 m^3) were sampled in the northeast Joinville Island Area. As a result of scattered concentrations and differing distribution attributes, frequency of occurrence, mean and median abundance relations differed within most areas. Krill were most frequent in the Joinville Island Area (89%) where median abundance (1.7 per 1,000 m^3) ranked second to that in the South Area (6.4 per 1,000 m^3), but the mean was smallest (4.3$\pm$ 5.4 per 1,000 m^3). In the West Area krill were least frequent (46% of samples), had the lowest median (0), but largest mean abundance (694$\pm$2,318 per 1,000 m^3). Frequency of occurrence (54%), mean and median abundance values (10.1$\pm$25.4 and 0.4 per 1,000 m^3) in the Elephant Island Area ranked third to those of other areas.

Length and Maturity Stage Composition (Table 4.2; Figures 4.12, 4.13A-D, 4.14A-D)

Small krill overwhelmingly dominated Survey D catches. The median length was 28mm, 10% were $\geq$38mm, and only a few individuals were >45mm. Accordingly, juveniles comprised 73% and immature stages 25% of the total. Predominantly small krill were collected in the West and South Areas, with those in the South (24mm mode, 25mm median and 5% $\geq$38mm) being slightly smaller than in the West Area (27mm mode, 29mm median and 10% $\geq$38mm). In the South and West Areas, respectively, juveniles made up 77% and 72%, immatures 23% and 27% and mature stages <1% and 1% of the total. Broader size ranges, larger median lengths and polymodal distributions were represented in the other areas. Within the Elephant Island Area lengths were distributed around 29-32mm, 42mm and 52mm modes, which probably correspond to 1, 3 and 5+ year old (i.e., 2001, 1999 and 1995 year classes); the median length was 36mm. Juveniles made up 39%, immatures 17% and mature forms 44%. Males outnumbered females by 50%, but sexually mature stages were fairly evenly represented (22% vs. 21%); most females were gravid or spent (85%) suggesting the end of the spawning season. In contrast, krill lengths in the Joinville Island Area were not centered around distinct modal sizes corresponding to age/maturity categories. Juveniles with 22, 25 and 27mm modes constituted 46% of the individuals; immature and mature stages were fairly evenly represented (28 and 26%, respectively). Although males and females were equally abundant virtually all males were immature and the mature stages were mostly gravid (16%) and spent (6%) females. Only within this area were 2-year-old krill (ca. 38mm mode representing the 2000 year class) relatively abundant.

Distribution Patterns (Figures 4.5B, 4.6C & D)

As during Survey A, cluster analysis (applied to 22 samples with $\geq$15 krill) yielded three geographically distinct length/maturity groups. Cluster 1 was represented at six stations south of the South Shetland Islands in west Bransfield Strait. These were predominantly juveniles (86%) with lengths centered around a 22-26mm mode. Immature forms comprised 12% and mature stages 2%. The median length was 25mm and 98% of individuals were $\leq$ 40mm. Cluster 2 occurred at 10 stations, mostly within Bransfield Strait, to the north and northeast of Cluster 1. Juveniles were again the dominant stage (48%), but these were larger, centered around a 27-29mm mode. The median length was 32mm and 16% of individuals were >40mm. Immature stages comprised 31% and included small (32-33mm, stage 2A) males as well as larger, regressing post spawning individuals (male 2c, 3a; female 2, 3a). Mature stages made up 21%; gravid and spent females (3d and 3e) were the most abundant (13% of total). Cluster 3 included six stations located over the South Shetland and Elephant Island shelves and was dominated (85%) by mature forms while juveniles made up 6% and immature stages 9%. The median length was 44mm, 10% of individuals were <32mm and 25% were >50mm. Lengths were primarily centered around 42-44mm, 48-49mm, 52 and 55mm modes representing 3-5+ year old krill. Overall, females outnumbered males by 40%. Mature males comprised 35% and gravid and spent females 53% of the total. Maturity stage composition and southern distributions of Cluster 2 and 3 reflected completion of the spawning season (Siegel, 1988).

4.3.2.2 *Salpa thompsoni*:

Abundance (Table 4.1B; Figure 4.7B)

Salps were collected at 76 Survey D stations (81%). Mean and median abundance values were 622 and 59 per 1,000 m^3, respectively. As with krill, a large standard deviation ($\pm$1,372) reflected uneven distribution across the survey area. Greatest concentrations, estimated to be 10,000-20,000 individuals and 4,757-8,756 per 1,000 m^3, were encountered at offshore Drake Passage stations in the West Area and resulted in a high mean value (1,217 per 1,000 m^3); the median was relatively low (24 per 1,000 m^3) due to patchiness. Within the Elephant Island Area largest salp concentrations (>2,000 per 1,000 m^3) were also associated with oceanic water but similar mean and median abundance values (570 and 250 per 1,000 m^3, respectively) reflected elevated and more evenly distributed concentrations. Salps were patchy and much less abundant in the South and Joinville Island Areas (means ca. 160 per 1,000 m^3, medians 2-8 per 1,000 m^3).

Maturity Stages, Size and Age (Fig. 4.8)

Aggregates again contributed the majority (96%) of individuals collected overall. Solitaries were rare (<2%) in the West and South Areas; they constituted 8% and 5% of the catch in the Elephant and Joinville Island Areas. In the Joinville Island Area these solitaries were primarily small, recently spawned forms <25mm; in the West and Elephant Island Areas they were primarily larger, actively budding individuals. Coincidentally, the majority of aggregates in the West (85%) and Elephant Island Areas (65%) were <20mm, with 12-15mm median and 10mm modal lengths. These resulted from a late season pulse of budding activity. Without this chain production, median and modal aggregate lengths were much larger in the South (23mm and 20mm) and Joinville Island Areas (44mm and 48mm).

Distribution Pattern (Fig. 4.15A,B)

In contrast to Survey A, cluster analysis (applied to aggregate length distributions in samples with $\geq$50 specimens) yielded two distinct, geographically coherent groups. Cluster 1 occurred at 36 stations, 30 of which were associated with Water Zones I and II over outer island shelves and offshore. The remaining six stations were associated with Zone V (continental shelf) water south of the South Shetland Islands within Western Bransfield Strait. This cluster was composed primarily of small individuals (80% $\leq$30mm, 16mm median) released within the past month. Cluster 2 aggregates occurred at 18 stations, most of which were over King George and Elephant Island shelves and associated with Water Zones III and IV. These were primarily large, sexually mature individuals (80% $\geq$35mm, 44mm median) presumably ready to produce the overwintering solitary form; recent aggregate chain production was essentially absent here. Size distributions of the two clusters were significantly different (K-S test D_{MAX}=66.1 at 34mm, P<0.01).

4.3.2.3 Zooplankton:

Overall Composition and Abundance (Tables 4.3, 4.5, 4.10B, 4.11B, 4.12, 4.13B; Figures 4.9C & D, 4.10C & D)

Survey D samples yielded a total of 93 taxonomic categories; overall mean and median values were 18 taxa per tow. Again, species richness was modestly greater in the Joinville Island Area (mean and median values 23 and 24 vs. 19-20 taxa per tow in other areas). Copepods remained the most frequently occurring (100% samples) and numerically dominant taxon (58% of individuals) with species abundance relations similar to those during Survey A (i.e., *C. acutus*>*C. propinquus*>*M. gerlachei*>*R. gigas*). Greatest mean and median copepod abundance was in the West Area followed by Elephant Island, Joinville Island and South Areas. This was primarily due to extremely large offshore concentrations of *C. acutus* and *C. propinquus*. Among copepod categories, West Area abundance of *C. propinquus* and *R. gigas* was significantly higher than in the South Area (ANOVA, P=0.03) and of copepodites was significantly higher than in Elephant Island (P<0.01) and South (P=0.04) Areas.

Although radiolarians occurred in only 36% of samples their mean abundance ranked second to copepods (7,900 vs. 15,900 per 1,000 m^3) due to extraordinarily large (to 200,000 per 1,000 m^3) primarily offshore concentrations. Larval *T. macrura* and chaetognaths were present in 97-98% of samples and overall ranked 3-4 in mean and 2-3 in median abundance. These were followed by *S. thompsoni* (81% of samples, 2.3% total mean abundance) and postlarval krill (1% mean abundance). *Themisto gaudichaudii* was present in 98% of samples and had a relatively large median value (17 per 1,000 m^3); its West Area abundance was significantly greater than in Elephant Island and Joinville Island Areas (ANOVA, P=0.02). Postlarval *T. macrura* and *E. frigida* were also relatively frequent (80% and 66% of samples) with relatively large medians (11 and 6 per 1,000 m^3). Bransfield Strait centered distributions are reflected in significantly greater South Area vs. Elephant Island Area abundance of *T. macrura* (P=0.02), *E. crystallorophias* (P=0.04) and ostracods (P=0.02).

Larval krill were present in 29% of samples with respective mean and median values of 61 and 0 per 1,000 m^3. C1 through F2 stages were collected. Calyptopis stages comprised 85% of the total with C3 dominant (50%). Greatest concentrations occurred in the West Area (mean 134 per 1,000 m^3) followed by Elephant Island, Joinville Island and South Areas (50, 29 and 4 per 1,000 m^3, respectively). Virtually all West and South Area larvae were calyptopis stages, predominantly C3 (70%) in the West and C1 and C2 (50% each) in the South. Calyptopis stages comprised 70% of Elephant Island Area larvae (C1=42%, C3=24%); 23% were F1. Calyptopis and furcilia larvae were more evenly represented in the Joinville Island Area due to similar proportions of C3 (30%) and F1 (27%).

Larval and postlarval stages of all five euphausiid species showed differing distribution patterns and relationships. Distributions of larval and postlarval krill were independent of each other.

While *T. macrura* larvae were collected in all four areas their offshore concentrations resulted in a strong negative correlation with postlarvae (Kendall's Tau *T*=-0.26, P<<0.01); this pattern has been described in previous AMLR field season reports. Larval *E. frigida* were also broadly distributed but most frequent and abundant in the South and Elephant Island Areas; like krill there was no apparent relationship between distributions of larval and postlarval stages. Although mean abundance of larval *E. crystallorophias* was highest in West and Elephant Island Areas they were most frequent in South and Joinville Island Areas; adults were almost exclusively collected in the South and overall catches of the larval and postlarval stages were positively correlated (*T*=+0.17, P=0.02). Because of their predominantly South Area presence, postlarval *E. crystallorophias* also had a significant positive correlation with larval *E. frigida* (*T*=+0.20, P<0.01) and negative correlation with larval *T. macrura* (*T*=-0.33, P<<<0.01). Concentrations of larval and postlarval *E. triacantha,* predominantly in the West, resulted in a significant positive correlation (*T*=+0.16, P=0.02), however, the overall distribution of *E. triacantha* postlarvae was most like that of larval *T. macrura* (*T*=+0.23, P<<0.01).

Abundance relationships between calyptopis and furcilia stage krill larvae and other zooplankton taxa suggest differing source areas. Pooled calyptopis larvae were positively correlated with two types of fish larvae, *Leptonotothen kempi* (*T*=+0.17, P=0.01) and *Electrona* spp (*T*=+0.15, P=0.03), and copepodites (*T*=+0.16, P=0.03); these taxa co-occurred primarily in Zone II water adjacent to the outer shelf. Five of 8 samples with furcilia larvae were also primarily adjacent to outer shelf in Zone II and III water. The other three samples were in the east Joinville Island Area (Zone V water) where abundant furcilia co-occurred with *Ihlea racovitzai* and *Limacina helicina* (*T*=+0.24 and +0.26, P<<0.01). These taxa were probably advected into the Joinville Island Area from the Weddell sea. As during Survey A, there was no significant positive correlation between larval krill and total copepod abundance (Kendalls Tau, P>0.05).

Distribution Patterns (Table 4.15; Figure 4.11B)

Cluster analysis (applied to taxa present in >20% of samples) yielded two groupings. Cluster 1, the smallest of these, was represented at 29 stations, 21 of which were over or offshore of the outer shelf. Although this distribution encompassed water Zones I-IV it appeared to reflect onshore-offshore dynamics associated with the strong oceanic eddy (See Physical Oceanography section of this report). Cluster 2 was represented at the remaining 65 shelf and coastal stations. The 23 taxonomic categories were included in both clusters and, except for radiolarians (almost exclusively in Cluster 1), shared similar abundance relationships. This is evidenced by PSI values for comparisons with (60.2) and without (83.6) radiolarians. Only one category, postlarval *T. macrura*, was significantly more abundant in Shelf-Coastal Cluster 2 (ANOVA, P=0.02). There was no significant difference between Cluster 1 and 2 abundance of eight taxa (*E. frigida*, larval and postlarval *E. superba*, ostracods, *T. gaudichaudii*, *Hyperiella dilatata, Cyllopus magellanicus* and *Spongiobranchaea australis*). Abundance of the remaining 14 taxa was significantly higher in Oceanic Cluster 1 (ANOVA, P<0.05).

4.3.2.4 Survey A and D 2002 Comparisons:

Krill (Tables 4.2, 4.3, 4.7-4.9; Figures 4.1-4.6, 4.12-4.14)

Seasonal differences in krill catch frequency and abundance resulted from changes in their distribution patterns and attributes. Overall decreased frequency of occurrence, substantially increased mean and standard deviation values and decreased median are the consequence of increased patchiness. This was associated with a significant proportional decrease of krill >40mm (K-S test, $p<0.01$), decline in proportions of mature vs. immature stages, and substantial changes in length/maturity characteristics within the survey areas. Between Surveys A and D, mean krill abundance increased in West and South Areas and decreased in Elephant and Joinville Island Areas, however only the Elephant Island Area decrease was significant (Z test, $P<0.05$). Increased abundance in the West Area was associated with elevated concentrations of juvenile and immature krill of 25-42mm lengths; that in the South Area was associated with increased concentrations of 20-24mm juveniles and >31mm immature stages. Despite marked abundance decreases, overall maturity stage composition did not change much in Elephant Island and South Areas (PSIs=92 and 89, respectively) compared to the West (75) and South (54) Areas.

Shifting distributions of length/maturity categories are seen in comparisons of Survey A and D krill clusters. Cluster 1 demographics (predominantly small juveniles) are quite similar for both surveys (stage PSI=96), but its distribution contracted from a broad Bransfield Strait presence to one limited to the western Strait. Cluster 3 stage composition (predominantly large mature animals) was also quite similar between the surveys (stage PSI=95), but the length composition showed increased proportions of 3+ krill (40-46mm) relative to larger, older age classes. This group demonstrated an onshore seasonal distribution change. Cluster 2 demonstrated large changes in both size and maturity composition (length D_{MAX}=46, stage PSI=63) which reflected a shift from predominantly mature 3+ krill (now partially incorporated into Cluster 3) to a mixture of large juvenile (1+), immature (2+) and mature (3+) individuals. As with the other groups, Cluster 2 distribution had a southward seasonal shift to the location of Cluster 1 during Survey A. As a result of seasonal migration, particularly by large individuals, krill carbon biomass in the Elephant Island Area was substantially (but not significantly) reduced.

Salpa thompsoni (Tables 4.3, 4.7; Figures 4.7, 4.8, 4.15)

The overall doubling of mean salp abundance during Survey D was attributed to the West Area where the mean was 13 times that of Survey A. This significant increase (Z test, $P<0.05$) was due to extremely large offshore concentrations of recently budded aggregates. Mean and standard deviation values in the Elephant Island Area were similar during the two surveys; an order of magnitude increase in median abundance resulted from 26 vs. 21 relatively large catches during Survey D. Cluster analysis results and length-frequency distributions during Survey D indicate that large, mature solitaries in Drake Passage (and to a lesser extent western Bransfield Strait) had migrated to surface layers for a late season pulse of aggregate chain production (Foxton, 1966; Casareto and Nemoto, 1986). Because of aggregate growth and presence of large solitaries median salp carbon biomass in the Elephant Island Area more than doubled between the two surveys. This increase in conjunction with decreased median krill biomass led to a substantial change in their ratio, from ca. 3:1 to 120:1.

Zooplankton (Tables 4.3-4.6, 4.10-4.15; Figures 4.9-4.11)

Ten fewer taxa were identified during Survey D, primarily the result of fewer unidentified crustacean categories. This decrease, plus lower mean and median values of species richness, could reflect a seasonal reduction in mesoplanktonic taxa. Total copepod abundance was significantly greater during Survey D (Z test, $P<0.01$) and resulted primarily from eastward expansion of extremely large offshore concentrations across much of the survey area. Increased copepod concentrations also were located in Bransfield Strait, presumably associated with retention systems south of King George and Livingston Islands and in the Joinville Island Area. Overall increased copepod abundance was largely due to *C. acutus, M. gerlachei* and *R. gigas* (ANOVA, $P<0.05$). In addition to copepods and salps, radiolarians and chaetognaths had significant abundance increases between the two surveys (ANOVA, $P<0.05$); postlarval *T. macrura*, ostracods and *Clio p. sulcata* had decreased abundance during Survey D but only that of *C. p. sulcata* was significant ($P<0.001$). Due to the huge mean abundance increase of radiolarians the proportional contribution by copepods to total zooplankton decreased from 68% to 58% between surveys and resulting PSI was 77 (72 if individual taxa are used vs. total copepods).

Among the dominant taxa chaetognaths were the only category with significant seasonal abundance increases within all four areas ($P<0.02$). Significant increases were observed for: *C. acutus, M. gerlachei, R. gigas, C. p. sulcata* and radiolarians (Elephant Island Area); *C. acutus, C. propinquus* and *E. frigida* (Joinville Island); *M. gerlachei* and *T. gaudichaudii* (South Area); and "other" copepods, *E. triacantha, Primno macropa, Vibilia antarctica* and *S. thompsoni* (West Area). Significant abundance decreases ($P<0.001$) occurred for larval *T. macrura* (West Area) and *C. p. sulcata* (West and Elephant Island Areas).

Mean larval krill abundance increased 3 times, between Surveys A and D and was associated with increased proportions of C3 vs. earlier stages. Greatest change was in the West Area where the mean (mostly C3 larvae) was two orders of magnitude greater than the previous month (134 vs. 1.5 per 1,000 m^3). Larval krill in the Elephant Island Area demonstrated a modest mean abundance increase (50 vs. 36 per 1,000 m^3) associated with a shift to greater proportions of C3 and F1 vs. younger stages. Decreased abundance in the South Area (13 to 4 per 1,000 m^3) was associated with loss of F1 and F2 stages. If the Survey A *Euphausia* sp. larvae in Joinville Island Area were largely *E. superba*, then mean abundance there had a large seasonal decrease (ca. 980 vs. 29 per 1,000 m^3) associated with a shift to greater proportions of F2 and F3 stages. Larval *E. frigida, E. crystallorophias* and *E. triacantha* were not identified during Survey A. During Survey D, larval *E. frigida* and *E. crystallorophias*, respectively, ranked 11 and 16 in overall mean abundance while *E. triacantha* larvae were fairly rare.

Marked changes in zooplankton clusters between the two surveys reflect (a) increased abundance and onshore expansion of Oceanic taxa and (b) blending of Shelf and Coastal taxa with little effect on their pooled abundance. Seasonal population growth along with intensified advective and mixing processes associated with the offshore gyre and Antarctic Circumpolar Current are likely forces behind these changes.

4.3.2.5 Survey D Between-Year Comparisons:

<u>Krill (Tables 4.7B, 4.8, 4.9)</u>

In stark contrast to Survey A, krill mean and median abundance values in the Elephant Island Area during February-March 2002 were among the lowest recorded over the past 11 years and resembled those of 1994 and 1995. Accordingly, low krill carbon biomass values matched those of 1995. Relatively large proportions of juveniles (39%), like 1992 and 1996, indicate good recruitment success of the previous year class. As during 2001, proportions of immature stages indicate only modest recruitment success from two years ago (1999/00). Maturity stage composition most resembled that of 1992 (PSI=90). Poor recruitment success since the 1995/96 year class together with age-related mortality are undoubtedly responsible for population size decrease. However, considering Survey A results, the magnitude of this decline may be magnified by seasonal migration away from the area. Large proportions of advanced female maturity stages have characterized the past four years and are in distinct contrast to 1992-1994 and 1998 when normal seasonal spawning did not appear to take place. The male to female ratio (1.5) is typical of that during 1992-1998 and contrasts with 1999-2001 when females outnumbered males.

Salps (Tables 4.7, 4.9; Figure 4.16)

Mean and median salp abundance in the Elephant Island Area during February-March has remained fairly stable since 1999; these values are approximately half those during highs in 1993, 1997 and 1998. However, the means are an order of magnitude, and medians two to three orders of magnitude, greater than during the 1995 and 1996 copepod years. The broad size range and late season pulse of small aggregate production yield a length frequency distribution quite similar to that of March 1997 (D_{MAX}<10). In the past, late season production has presaged salp blooms the following summer. As with abundance, Survey D salp carbon biomass has remained fairly stable since 1998. In contrast, the salp:krill biomass ratio of 120:1 is unprecedented and reflects apparent migration of krill out of the survey area.

Zooplankton (Tables 4.5, 4.7, 4.9B, 4.10B, 4.11B)

For the same reasons listed for Survey A, substantially more taxa were collected this year (83 vs. 57-62). However, mean and median numbers of taxa per tow in the West and Elephant Island as well as South Areas (17-19) were smaller than those during 2001 Survey D (20-25) suggesting a seasonal decrease in species richness. Overall mean abundance of a number of taxa was substantially greater than reported from previous February-March surveys due to their large concentrations in one or more areas: Copepods (notably *C. acutus* and *M. gerlachei*) and chaetognaths (all four areas); *Themisto gaudichaudii* and *P. macropa* (West, Elephant and South); radiolarians, larval *T. macrura* and *Vibilia antarctica* (West and Elephant); *Hyperiella dilatata* (West, Elephant and Joinville); *E. frigida* (West); *E. crystallorophias* and larval *L. larseni* (South).

Copepod abundance in the Elephant Island Area was the highest observed during February-March AMLR surveys with mean and median values 2 times the highs of 2000. Due to summer spawning *M. gerlachei* joined *C. acutus* and *C. propinquus* in being primarily responsible for these elevated concentrations. Mean and median abundance values of *C. acutus* exceeded, and those of *C. propinquus* were comparable to, those recorded during the krill "superswarm" year 1984; *M. gerlachei* abundance was comparable to the highs of 2000. Postlarval *T. macrura* abundance was among the lowest reported since 1993. Like postlarval krill, this euphausiid was much less abundant here (as well as West and South Areas) than during Survey A suggesting movement out of the upper water column and/or area. Like copepods, larval *T. macrura* and chaetognaths were more abundant than during previous AMLR surveys. Larval krill mean abundance ranked five in the 8 years of data available. This is not particularly bleak, given (a) seasonally increased abundance and advanced development and (b) relatively large proportions of C3 and F1 stages.

Copepods have numerically dominated the Elephant Island Area during all February-March surveys except 1995 when larval krill were extraordinarily abundant and the 1998 salp year. Such extreme dominance (>80% of individual zooplankters) was most similar to 1994 (PSI=86). Overall species abundance relationships were fairly consistent with those over the past three years and during 1996 (PSI=70-79) with copepods, larval *T. macrura*, chaetognaths and salps being the most abundant taxa. *Salpa thompsoni* has remained the fourth ranked taxon over this period

4.3.3 AMLR 2001/02 Cruise Summary:

(A) Mean and median krill abundance in the Elephant Island Area during January was relatively high and, respectively, ranked 2 and 4 in the 1992-2002 data set; the February-March values were among the lowest recorded. These differences resulted from seasonal distribution changes across the large survey area.

(B) Small juveniles, representing successful recruitment of the 2000/2001 year class, numerically dominated catches in the Elephant Island, Joinville Island, South and West Areas during Surveys A and D.

(C) Relatively small proportions of two-year-old intermediate sized immature forms in all four areas support last year's observations of low 1999/2000 year class success.

(D) Larval krill were moderately abundant in the Elephant Island Area. Relatively large proportions of furcilia and early calyptopis stages during both surveys indicate a very early initiation (e.g., late November-early December) and prolonged spawning season compared to other years. A modest seasonal abundance increase in conjunction with increased proportions of advanced developmental stages bodes well for recruitment success of the 2001/2002 year class.

(E) *Salpa thompsoni* abundance in the Elephant Island Area was moderately high and similar to values observed in 1999-2001. A late season pulse of chain production may presage a salp bloom during 2002/03.

(F) Greatly increased zooplankton diversity over previous years resulted from the expanded survey area, a more protective cod-end and refined identification techniques. Species richness was highest in the Joinville Island Area influenced by the Weddell Sea.

(G) Copepods (notably *Calanoides acutus*, *Calanus propinquus* and *Metridia gerlachei*), were by far the most abundant zooplankton category; their mean and median abundance values were by far the highest encountered during AMLR surveys. Concentrations of larval *Thysanoessa macrura*, postlarval *Euphausia frigida* and chaetognaths were also the highest recorded.

4.4 Disposition of Data and Samples: All of the krill, salp and other zooplankton data have been digitized and are available upon request from Valerie Loeb. These data have been submitted to Roger Hewitt (Southwest Fisheries Science Center). Frozen krill and myctophids were provided to Mike Goebel and Dan Costa (UCSC) for chemical analyses.

4.5 Problems and Suggestions: Expansion of the large survey area across Bransfield Strait into areas directly influenced by west Antarctic Peninsula, Gerlache Strait and Weddell Sea dynamics has greatly improved our ability to link biological and hydrographic processes within the South Shetland-Elephant Island Area. This is especially important in that the warming environment and glacial retreat, especially in the western Weddell Sea, may already be altering krill distribution, behavior and population dynamics. We strongly urge development of a coordinated research effort, possibly within CCAMLR, to provide base line data on recently opened pelagic (i.e., seasonal sea ice) and benthic (i.e., virgin fish stock) habitats in the western Weddell Sea.

Again it was extremely helpful to have the expert assistance of CTD technicians at sea. However, we are still handicapped by the lack of an experienced physical oceanographer who can provide real time information on water mass distribution and dynamics. With regard to hydrodynamics, it would be extremely beneficial to have information provided by an acoustic Doppler current profiler. This is especially true for examining transport of krill larvae in relation to recruitment success in the survey area and advection to South Georgia.

The zooplankton van would benefit from modifications making it more comfortable and more easily maintained for use by both the krill and fish stock assessment surveys. Improvements would include (a) replacing storage areas with microscope benches allowing assistants to be seated while performing sample analyses and (b) installation of stainless steel counters to allow efficient and effective cleaning.

4.6 References:

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Table 4.1. AMLR 2002 Large-area survey IKMT station information. Double lines denote subarea divisions.

A. SURVEY A

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
SOUTH AREA										
A15-15	15/01/02	2311	2331	T	171	1976.7	0	0.0	83	42.0
A16-14	16/01/02	0219	0242	N	171	2377.3	0	0.0	180	75.7
A17-13	16/01/02	0522	0549	D	171	2575.1	2	0.8	88	34.2
WEST AREA										
A18-12	16/01/02	0837	0900	D	171	2307.6	40	17.3	0	0.0
A19-11	16/01/02	1204	1228	D	170	2428.1	14	5.8	7	2.9
A20-10	16/01/02	1605	1633	D	170	2635.6	0	0.0	26	9.9
A19-09	16/01/02	1925	1949	D	171	2466.7	1	0.8	1720	697.3
A18-10	16/01/02	2255	2317	N	171	2161.0	0	0.0	344	159.2
A17-11	17/01/02	0206	0225	N	115	2031.7	1455	716.2	186	91.6
A16-10	17/01/02	0501	0528	D	170	2544.2	127	49.9	3	1.2
A17-09	17/01/02	0819	0840	D	171	2034.4	28	13.8	59	29.0
A18-08	17/01/02	1152	1215	D	170	2116.4	0	0.0	244	115.3
A17-07	17/01/02	1531	1555	D	170	2512.5	0	0.0	196	78.0
A16-08	17/01/02	1919	1942	D	170	2552.0	1	0.4	92	36.1
A15-09	17/01/02	2230	2255	T	174	2656.5	59	22.2	194	73.0
A14-10	18/01/02	0146	0157	N	60	967.2	37	38.3	6	6.2
A13-09	18/01/02	0414	0440	T	174	2736.0	7	2.6	17	6.2
A14-08	18/01/02	0809	0833	D	171	2283.9	15	6.6	25	10.9
A15-07	18/01/02	1145	1208	D	170	2478.7	2	0.8	109	44.0
A16-06	18/01/02	1531	1555	D	169	2309.4	0	0.0	90	39.0
A15-05	18/01/02	1908	1933	D	169	2295.9	0	0.0	284	123.7
A14-06	18/01/02	2238	2301	N	170	2226.0	0	0.0	422	189.6
A13-07	19/01/02	0200	0228	N	170	2719.4	1	0.4	484	178.0
A12-08	19/01/02	0512	0535	D	170	2119.4	39	18.4	1	0.5
A11-07	19/01/02	0836	0900	D	169	2491.6	389	156.1	2	0.8
A11-05	19/01/02	1254	1319	D	170	2479.4	0	0.0	81	32.7
A11-03	19/01/02	1718	1744	D	173	2392.4	0	0.0	290	121.2
A11-01	19/01/02	2131	2153	T	171	2190.4	0	0.0	598	273.0
ELEPHANT ISLAND AREA										
A09-01	20/01/02	0147	0208	N	170	2111.1	0	0.0	2208	1045.9
A09-02	20/01/02	0440	0505	D	169	2351.5	3	1.3	2904	1235.0
A09-03	20/01/02	0734	0758	D	171	2509.1	1	0.4	2526	1006.7
A09-04	20/01/02	1026	1049	D	169	2291.5	9	3.9	177	77.2
A09-05	20/01/02	1321	1348	D	171	2623.1	24	9.1	286	109.0
A09-06	20/01/02	1705	1732	D	170	2759.6	0	0.0	17	6.2
A09-07	20/01/02	2037	2053	D	170	2281.6	39	17.1	0	0.0
A09-08	20/01/02	2321	2342	N	169	2167.3	77	35.5	21	9.7
A08-08	21/01/02	0202	0230	N	170	2992.2	3	1.0	3	1.0
A08-06	21/01/02	0718	0744	D	170	2590.7	3	1.2	14	5.4
A08-04	21/01/02	1306	1332	D	169	2730.9	0	0.0	180	65.9
A08-02	21/01/02	2015	2039	D	171	2241.9	1	0.4	1932	861.8
A07-01	21/01/02	2345	0011	N	170	2420.8	24	9.9	1302	537.8
A07-02	21/01/02	0232	0259	N	174	2825.3	8	2.8	1736	614.5
A07-03	22/01/02	0527	0551	D	170	2358.0	0	0.0	2868	1216.3
A07-04	22/01/02	0829	0851	D	174	2307.9	3	1.3	650	281.6
A07-05	22/01/02	1115	1135	D	171	2241.4	5	2.2	0	0.0
A07-06	22/01/02	1418	1442	D	170	2504.1	51	20.4	0	0.0
A07-07	22/01/02	1723	1749	D	170	2377.7	76	32.0	84	35.3
A07-08	22/01/02	2015	2038	D	170	2341.9	1	0.4	32	13.7
A06-08	22/01/02	2251	2317	N	170	2349.3	0	0.0	1617	688.3
A06-06	23/01/02	0256	0319	N	140	2140.7	20	9.3	18	8.4
A05-04	23/01/02	0750	0815	D	171	2333.6	48	20.6	41	17.6
A05-02	23/01/02	1238	1304	D	170	2509.1	21	8.4	957	381.4
A04-01	23/01/02	1619	1642	D	170	2431.0	5	2.1	27	11.1
A04-02	23/01/02	1904	1926	D	170	2156.0	49	22.7	788	365.5
A04-03	23/01/02	2201	2222	N	170	2141.2	810	378.3	3839	1792.9
A04-04	24/01/02	0052	0120	N	170	2601.3	219	84.2	181	69.6
A04-05	24/01/02	0330	0355	N	170	2523.2	609	241.4	238	94.3
A04-06	24/01/02	0718	0740	D	156	2115.0	14	6.6	80	37.8
A04-07	24/01/02	1843	1905	D	170	2105.6	3	1.4	0	0.0
A04-08	24/01/02	2130	2154	T	170	2311.7	1	0.4	521	225.4

Tab. 4.1 (Contd.)
SURVEY A

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
A03-08	25/01/02	0006	0031	N	170	2500.7				
A03-06	25/01/02	0418	0443	T	170	2446.8	2	0.8	78	31.9
A03-04	25/01/02	0925	0949	D	171	2157.1	1	0.5	81	37.6
A03-02	25/01/02	1359	1426	D	170	2736.8	81	29.6	7	2.6
A02-01	25/01/02	1731	1755	D	170	2370.6	31	13.1	95	40.1
A02-02	25/01/02	2019	2039	D	170	2274.5	26	11.4	168	73.9
A02-03	25/01/02	2254	2318	N	170	2280.6	263	115.3	820	359.6
A02-04	26/01/02	0131	0149	N	170	2149.6	218	101.4	784	364.7
A02-05	26/01/02	0409	0434	T	170	2233.1	1024	458.6	1352	605.4
A02-06	26/01/02	0709	0733	D	169	2219.4	34	15.3	401	180.7
A02-07	26/01/02	0955	1018	D	170	2317.8	84	36.2	1432	617.8
A02-08	26/01/02	1237	1302	D	171	2431.1	45	18.5	6848	2816.8
JOINVILLE ISLAND AREA										
A02-09	26/01/02	1527	1555	D	171	2323.0	0	0.0	2761	1188.6
A02-11	26/01/02	1943	2006	D	170	2024.5	263	129.9	3	1.5
A02-13	26/01/02	2333	2356	N	170	2118.0	30	14.2	12	5.7
A04-13	27/01/02	0321	0348	N	171	2523.4	5	2.0	0	0.0
A04-11	27/01/02	0720	0745	D	171	2337.9	24	10.3	0	0.0
A04-09	27/01/02	1159	1223	D	168	2359.5	0	0.0	637	270.0
A06-09	27/01/02	1617	1642	D	170	2478.9	0	0.0	463	186.8
A06-11	27/01/02	2021	2043	D	170	2060.0	106	51.5	0	0.0
A06-12	27/01/02	2247	2312	T	170	2291.5	1139	497.1	0	0.0
SOUTH AREA										
A07-11	28/01/02	0139	0205	N	171	2452.3	1970	803.3	200	81.6
A08-10	28/01/02	0453	0519	T	170	2456.7	3	1.2	607	247.1
A09-09	28/01/02	0736	0748	D	86	1135.5	0	0.0	0	0.0
A10-10	28/01/02	1042	1104	D	170	1757.0	0	0.0	0	0.0
A09-11	28/01/02	1403	1428	D	170	2703.7	3993	1476.9	59	21.8
A08-12	28/01/02	1656	1720	D	156	2330.6	1068	458.3	3	1.3
A09-13	28/01/02	1950	2004	D	110	1355.3	2	1.5	157	115.8
A10-12	28/01/02	2257	2321	N	170	2332.7	0	0.0	3044	1304.9
A11-11	29/01/02	0225	0249	N	170	2400.0	1	0.4	2724	1135.0
A12-12	29/01/02	0550	0615	D	171	2555.7	3	1.2	375	146.7
A11-13	29/01/02	0858	0920	D	173	2396.3	2	0.8	162	67.6
A12-14	29/01/02	1153	1220	D	166	2830.6	0	0.0	202	71.4
A13-13	29/01/02	1526	1550	D	170	2725.1	10	3.7	204	74.9
A14-12	29/01/02	1836	1858	D	171	2082.2	3	1.4	2	1.0
					SURVEY AREA A					
					N=95		14777		59988	
						AVG		65.5		267.7
						STD		202.3		487.5
						MEDIAN		2.0		69.6
					WEST AREA					
					N=25		2215		5480	
						AVG		42.0		92.8
						STD		141.2		142.6
						MEDIAN		0.8		39.0
					ELEPHANT ISLAND AREA					
					N=44		3938		42542	
						AVG		39.0		409.9
						STD		93.3		614.7
						MEDIAN		7.5		85.8
					JOINVILLE ISLAND AREA					
					N=9		1567		3876	
						AVG		78.3		183.6
						STD		153.4		367.7
						MEDIAN		10.3		1.5
					SOUTH AREA					
					N=17		7057		8090	
						AVG		161.7		201.2
						STD		390.5		378.1
						MEDIAN		0.8		71.4

Table 4.1 (Contd.)
B. SURVEY D

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
SOUTH AREA										
D15-15	24/02/02	0204	0230	N	171	2861.9	21654	7566.4	198	69.2
D16-14	24/02/02	0506	0530	N	171	2543.8	69	27.1	0	0.0
D17-13	24/02/02	0759	0824	D	170	2505.6	2	0.8	0	0.0
WEST AREA										
D18-12	24/02/02	1104	1128	D	170	2513.4	0	0.0	2	0.8
D19-11	24/02/02	1422	1446	D	170	2392.4	2	0.8	0	0.0
D20-10	24/02/02	1814	1839	D	170	2427.3	0	0.0	1710	704.5
D18-10	25/02/02	0253	0324	N	170	3199.4	4	1.3	76	23.8
D17-11	25/02/02	0610	0627	D	120	1586.4	6	3.8	0	0.0
D16-10	25/02/02	0947	1010	D	170	2328.6	0	0.0	0	0.0
D17-09	25/02/02	1336	1402	D	172	2685.0	0	0.0	3	1.1
D18-08	25/02/02	1704	1731	D	171	2661.7	0	0.0	77	28.9
D17-07	25/02/02	2045	2045	T	169	2359.0	0	0.0	8964	3800.0
D16-08	26/02/02	0008	0037	N	170	2884.6	2	0.7	430	149.1
D15-09	26/02/02	0325	0351	N	169	2774.2	28	10.1	270	97.3
D14-10	26/02/02	0617	0631	D	81	1460.4	10695	7323.1	0	0.0
D13-09	26/02/02	0929	0952	D	165	2221.3	20700	9318.7	0	0.0
D14-08	26/02/02	1307	1332	D	170	2451.7	4	1.6	14	5.7
D15-07	26/02/02	1657	1721	D	171	2294.7	0	0.0	7	3.1
D16-06	26/02/02	2022	2045	T	170	2171.8	0	0.0	3328	1532.4
D15-05	26/02/02	2357	0025	N	170	2671.6	0	0.0	18292	6846.7
D14-06	27/02/02	0331	0400	N	171	2576.1	1	0.4	3961	1537.6
D13-07	27/02/02	0731	0758	D	170	2443.2	0	0.0	19	7.8
D12-08	27/02/02	1042	1105	D	171	1970.7	0	0.0	49	24.9
D11-07	27/02/02	1404	1432	D	171	3277.4	11	3.4	0	0.0
D11-05	27/02/02	1859	1927	D	171	2582.6	0	0.0	2395	927.4
D11-03	27/02/02	2325	2348	N	170	2259.3	0	0.0	19782	8755.8
D11-01	28/02/02	0325	0349	N	170	2156.8	1	0.5	10260	4757.0
ELEPHANT ISLAND AREA										
D09-01	28/02/02	0750	0813	D	170	2154.5	0	0.0	5650	2622.4
D09-02	28/02/02	1030	1053	D	170	1954.3	0	0.0	689	352.6
D09-03	28/02/02	1313	1337	D	170	2448.1	0	0.0	4705	1921.9
D09-04	28/02/02	1548	1613	D	170	2382.0	0	0.0	1050	440.8
D09-05	28/02/02	1819	1843	D	171	2334.1	0	0.0	30	12.9
D09-06	28/02/02	2055	2119	T	169	2215.0	72	32.5	410	185.1
D09-07	28/02/02	2336	2349	N	170	2358.6	3	1.3	675	286.2
D09-08	01/03/02	0148	0210	N	170	2414.4	1	0.4	170	70.4
D08-08	01/03/02	0413	0441	N	170	2580.9	15	5.8	452	175.1
D08-06	01/03/02	0835	0859	D	170	2084.0	7	3.4	6	2.9
D08-04	01/03/02	1241	1306	D	170	2412.7	0	0.0	1536	636.6
D08-02	01/03/02	1640	1707	D	170	2475.2	0	0.0	740	299.0
D07-01	01/03/02	1948	2010	T	170	1824.4	0	0.0	5260	2883.1
D07-02	01/03/02	2232	2257	N	170	2253.7	4	1.8	6544	2903.7
D07-03	02/03/02	0116	0141	N	169	2850.8	3	1.1	2916	1022.9
D07-04	02/03/02	0414	0444	N	170	2839.1	2	0.7	5540	1951.3
D07-05	02/03/02	0710	0735	D	170	2154.7	1	0.5	122	56.6
D07-06	02/03/02	0949	1006	D	170	2194.8	2	0.9	0	0.0
D07-07	02/03/02	1212	1237	D	170	2486.8	0	0.0	5	2.0
D07-08	02/03/02	1454	1519	D	171	2346.0	0	0.0	0	0.0
D06-08	02/03/02	1733	1759	D	170	2402.2	0	0.0	0	0.0
D06-06	02/03/02	2121	2140	N	140	1536.2	113	73.6	1	0.7
D05-04	03/03/02	0153	0214	N	169	2019.4	0	0.0	1415	700.7
D05-02	03/03/02	0600	0626	T	170	2567.2	0	0.0	1235	481.1
D04-01	03/03/02	0919	0942	D	170	2095.9	0	0.0	1398	667.0
D04-02	03/03/02	1214	1236	D	170	2141.0	0	0.0	745	348.0
D04-03	03/03/02	1501	1524	D	170	2274.5	3	1.3	40	17.6
D04-04	03/03/02	1740	1815	D	171	2512.8	0	0.0	14	5.6
D04-05	03/03/02	2030	2052	N	170	2059.8	231	112.1	3094	1502.1
D04-06	04/03/02	0124	0146	N	149	2229.4	194	87.0	132	59.2
D04-07	04/03/02	0524	0550	T	170	2232.1	4	1.8	833	373.2
D04-08	04/03/02	0814	0837	D	170	2285.1	0	0.0	62	27.1
D03-08	04/03/02	1045	1108	D	170	2125.1	0	0.0	458	215.5

Table 4.1 (Contd.)
SURVEY D

STATION #	DATE	TIME START (LOCAL)	TIME END (LOCAL)	DIEL	TOW DEPTH (m)	FLOW VOLUME (m3)	KRILL ABUNDANCE TOTAL	KRILL ABUNDANCE #/1000M3	SALP ABUNDANCE TOTAL	SALP ABUNDANCE #/1000M3
D03-06	04/03/02	1444	1507	D	170	2395.0	4	1.7	0	0.0
D03-04	04/03/02	1905	1931	D	170	2312.9	1	0.4	69	29.8
D03-02	04/03/02	2358	0021	N	170	2323.9	6	2.6	1141	491.0
D02-01	05/03/02	0345	0410	N	171	2244.1	9	4.0	2707	1206.3
D02-02	05/03/02	0648	0714	D	170	2436.8	0	0.0	493	202.3
D02-03	05/03/02	1003	1026	D	171	2047.1	0	0.0	158	77.2
D02-04	05/03/02	1315	1341	D	171	2571.2	195	75.8	153	59.5
D02-05	05/03/02	1611	1633	D	174	1784.0	1	0.6	524	293.7
D02-06	05/03/02	1909	1943	T	170	2095.9	19	9.1	1535	732.4
D02-07	05/03/02	2201	2226	N	170	2325.9	1	0.4	1012	435.1
D02-08	06/03/02	0020	0047	N	170	2576.5	17	6.6	3465	1344.8
JOINVILLE ISLAND AREA										
D02-09	06/03/02	0251	0313	N	171	2302.3	21	9.1	816	354.4
D02-11	06/03/02	0659	0724	D	170	2294.9	4	1.7	2	0.9
D02-13	06/03/02	1054	1120	D	170	2465.8	9	3.6	2	0.8
D04-13	06/03/02	1444	1508	D	170	2600.3	2	0.8	28	10.8
D04-11	06/03/02	1830	1854	D	170	2272.3	0	0.0	0	0.0
D04-09	06/03/02	2232	2256	N	169	2201.4	39	17.7	1193	541.9
D06-09	07/03/02	0245	0312	N	171	2402.2	9	3.7	1346	560.3
D06-11	07/03/02	0657	0723	D	170	2419.3	1	0.4	5	2.1
D06-12	07/03/02	0927	0952	D	170	2250.7	3	1.3	0	0.0
SOUTH AREA										
D07-11	07/03/02	1220	1245	D	170	2427.5	0	0.0	48	19.8
D08-10	07/03/02	1532	1555	D	170	2229.4	1	0.4	1	0.4
D09-09	07/03/02	1756	1808	D	75	1076.7	0	0.0	0	0.0
D10-10	07/03/02	2101	2123	N	170	1920.0	16	8.3	194	101.0
D09-11	08/03/02	0016	0039	N	170	2333.4	15	6.4	127	54.4
D08-12	08/03/02	0327	0348	N	161	2223.8	643	289.1	0	0.0
D09-13	08/03/02	0631	0648	D	115	1577.7	335	212.3	336	213.0
D10-12	08/03/02	0936	1002	D	170	2472.1	5	2.0	0	0.0
D11-11	08/03/02	1247	1314	D	171	2675.3	0	0.0	0	0.0
D12-12	08/03/02	1606	1632	D	170	2424.2	0	0.0	23	9.5
D11-13	08/03/02	1911	1937	D	170	2447.0	0	0.0	20	8.2
D12-14	08/03/02	2209	2227	N	120	1722.8	1136	659.4	56	32.5
D13-13	09/03/02	0145	0211	N	170	2622.2	1400	533.9	5650	2154.6
D14-12	09/03/02	0458	0527	N	170	2764.2	36	13.0	4	1.4
					SURVEY AREA D					
					N=94		57762		136872	
						AVG		281.4		621.6
						STD		1426.0		1372.5
						MEDIAN		0.5		59.4
					WEST AREA					
					N=24		31454		69639	
						AVG		694.3		1216.8
						STD		2317.5		2337.9
						MEDIAN		0.0		24.3
					ELEPHANT ISLAND AREA					
					N=44		908		57184	
						AVG		9.7		570.3
						STD		25.4		782.3
						MEDIAN		0.4		290.0
					JOINVILLE ISLAND AREA					
					N=9		88		3392	
						AVG		4.3		163.5
						STD		5.4		234.0
						MEDIAN		1.7		2.1
					SOUTH AREA					
					N=17		25312		6657	
						AVG		548.2		156.7
						STD		1765.5		502.3
						MEDIAN		6.4		8.2

Table 4.2 Maturity stage composition of krill collected in the large survey area and four subareas during January-March 2002. Advanced maturity stages are proportions of mature females that are 3c-3e in January and 3d-3e in February-March.

	E. superba January 2002				
Area	Survey A	West	Elephant I.	Joinville I.	South
Stage	%	%	%	%	%
Juveniles	72.5	57.3	46.3	92.5	88.2
Immature	10.9	16.7	9.0	6.0	11.8
Mature	16.6	26.0	44.7	1.5	0.0
Females:					
F2	2.2	4.5	0.4	1.9	2.7
F3a	0.5	2.4	0.5	0.1	0.0
F3b	0.8	0.9	2.3	0.0	0.0
F3c	4.2	1.9	13.7	0.0	0.0
F3d	4.9	14.8	10.0	0.7	0.0
F3e	1.8	0.0	6.2	0.0	0.0
Advanced Stages	89.8	83.5	91.6	87.4	0.0
Males:					
M2a	6.1	8.3	3.0	3.6	8.0
M2b	2.0	3.1	4.0	0.5	0.7
M2c	0.7	0.8	1.5	0.1	0.4
M3a	0.5	0.2	1.7	0.2	0.0
M3b	3.9	5.8	10.4	0.5	0.0
Male:Female	0.9	0.8	0.6	1.8	3.3
No. measured	2629	559	1437	319	314

	February-March 2002				
Area	Survey D	West	Elephant I.	Joinville I.	South
Stage	%	%	%	%	%
Juveniles	73.3	71.8	38.9	46.0	76.9
Immature	25.2	27.1	17.3	27.7	23.0
Mature	1.5	1.1	43.8	26.3	0.1
Females:					
F2	5.4	5.1	3.3	2.2	5.8
F3a	0.2	0.3	0.9	1.1	0.0
F3b	0.0	0.0	0.2	1.1	0.0
F3c	0.1	0.0	2.2	0.0	0.1
F3d	0.3	0.0	14.7	16.1	0.1
F3e	0.5	0.7	3.6	5.5	0.0
Advanced Stages	77.5	73.8	85.2	90.5	55.0
Males:					
M2a	11.9	12.4	8.8	17.4	11.2
M2b	6.7	8.2	3.6	5.8	4.9
M2c	1.2	1.4	1.6	2.3	1.1
M3a	0.0	0.0	0.3	1.2	0.0
M3b	0.4	0.0	22.1	1.2	0.0
Male:Female	3.1	3.6	1.5	1.1	2.9
No. measured	1542	268	558	88	628

Table 4.3. Composition and abundance of zooplankton assemblages sampled in large Survey A and D areas, January-March, 2002. F(%) is frequency of occurrence in samples. R is rank and % is percent of total mean abundance represented by each taxon. L and J denote larval and juvenile stages.

	SURVEY A AREA (N=95)						SURVEY D AREA (N=94)					
TAXON	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN
Copepods	100.0	1	67.6	7536.2	14950.1	2305.5	100.0	1	58.3	15904.8	24429.7	6742.7
Calanoides acutus	98.9		34.4	3838.7	8043.7	1001.0	100.0		27.1	7375.0	11497.5	2771.0
Calanus propinquus	100.0		20.6	2299.7	4956.3	551.7	100.0		15.9	4322.9	8751.9	1341.4
Metridia gerlachei	83.2		6.1	682.1	1891.8	140.8	94.7		9.5	2588.0	3380.3	1172.5
Rhincalanus gigas	60.0		2.4	266.1	684.4	14.8	84.0		4.6	1258.7	2870.1	144.7
Other copepods	60.0		2.1	238.5	715.5	20.9	24.5		0.4	110.4	334.4	0.0
Pareuchaeta antarctica	83.2		1.6	183.3	344.5	60.6	70.2		0.6	153.9	233.6	49.1
Copepodites	10.5		0.2	18.3	107.9	0.0	11.7		0.1	24.9	102.1	0.0
Pleuromama robusta	8.4		0.1	7.1	47.9	0.0	12.8		0.2	61.1	262.5	0.0
Pareuchaeta simillus	1.1		0.0	1.9	18.2	0.0	0.0		0.0	0.0	0.0	0.0
Eucalanus sp.	1.1		0.0	0.4	3.5	0.0	0.0		0.0	0.0	0.0	0.0
Haloptilus ocellatus	0.0		0.0	0.0	0.0	0.0	4.3		0.0	10.0	53.9	0.0
Thysanoessa macrura (L)	90.5	2	12.8	1428.1	2673.5	190.1	96.8	3	4.1	1111.5	2230.0	202.8
Radiolarians	42.1	3	9.2	1030.2	4958.2	0.0	36.2	2	29.0	7918.3	26891.7	0.0
Salpa thompsoni	88.4	4	2.4	267.7	487.5	69.6	80.9	5	2.3	621.6	1372.5	59.4
Thysanoessa macrura	92.6	5	2.0	222.6	714.9	39.3	79.8	7	0.4	112.8	251.6	10.8
Chaetognaths	81.1	6	1.5	170.9	327.9	63.2	97.9	4	3.2	880.1	1165.3	337.0
Ostracods	28.4	7	1.0	111.0	926.9	0.0	22.3	12	0.2	42.6	114.6	0.0
Euphausia spp. (L)	11.6	8	0.8	93.5	815.4	0.0	3.2		0.0	4.4	33.9	0.0
Euphausia superba	74.7	9	0.6	65.5	202.3	2.0	57.4	6	1.0	281.6	1426.0	0.5
Clio pyramidata sulcata	75.8	10	0.5	53.4	111.2	6.5	5.3		0.0	0.2	0.9	0.0
Themisto gaudichaudii	86.3	11	0.3	32.5	53.5	13.7	97.9	13	0.1	30.2	41.1	16.9
Euphausia frigida	42.1	12	0.2	20.5	61.1	0.0	66.0	8	0.3	80.0	302.6	6.1
Euphausia superba (L)	28.4	13	0.2	19.4	48.6	0.0	28.7	10	0.2	61.0	220.4	0.0
Euphausia crystallophorias	12.6	14	0.1	16.5	114.0	0.0	11.7	9	0.2	65.3	473.9	0.0
Decapods	9.5	15	0.1	14.0	127.9	0.0	0.0		0.0	0.0	0.0	0.0
Unid. Eggs	2.1		0.1	10.1	94.8	0.0	0.0		0.0	0.0	0.0	0.0
Polychaetes	15.8		0.1	6.7	30.0	0.0	1.1		0.0	0.0	0.1	0.0
Primno macropa	52.6		0.1	6.3	15.5	0.4	57.4	14	0.1	28.2	93.8	0.9
Vibilia antarctica	66.3		0.0	3.9	8.0	0.9	46.8	15	0.1	22.2	92.4	0.0
Lepidonotothen larseni (L)	18.9		0.0	3.8	20.2	0.0	11.7		0.0	1.8	15.2	0.0
Larval Fish (unid.)	8.4		0.0	3.3	23.7	0.0	1.1		0.0	0.0	0.0	0.0
Cyllopus magellanicus	44.2		0.0	3.3	11.7	0.0	34.0		0.0	2.8	10.2	0.0
Tomopteris spp.	46.3		0.0	3.0	9.9	0.0	18.1		0.0	1.1	3.6	0.0
Cumaceans	2.1		0.0	2.7	26.2	0.0	1.1		0.0	0.2	0.0	0.0
Clione limacina	40.0		0.0	2.3	7.5	0.0	4.3		0.0	0.1	0.7	0.0
Spongiobranchaea australis	69.5		0.0	1.9	3.0	1.0	47.9		0.0	1.3	3.2	0.0
Decapods (L)	3.2		0.0	1.7	11.2	0.0	0.0		0.0	0.0	0.0	0.0
Acanthophyra pelagica	2.1		0.0	1.5	14.6	0.0	1.1		0.0	0.0	0.2	0.0
Cyllopus lucasii	34.7		0.0	1.4	3.9	0.0	30.9		0.0	3.0	11.6	0.0
Hyperiella dilatata	53.7		0.0	1.3	2.9	0.4	38.3		0.0	2.6	8.1	0.0
Ihlea racovitzai	12.6		0.0	1.1	4.6	0.0	5.3		0.0	0.3	1.6	0.0
Euphausia triacantha	7.4		0.0	0.8	4.1	0.0	22.3		0.0	2.2	5.7	0.0
Crustacean larvae	1.1		0.0	0.8	7.8	0.0	0.0		0.0	0.0	0.0	0.0
Limacina helicina	12.6		0.0	0.8	3.5	0.0	5.3		0.0	0.6	3.7	0.0
Dimophyes arctica	13.7		0.0	0.6	3.6	0.0	8.5		0.0	0.1	0.7	0.0
Hyperiids	4.2		0.0	0.5	4.1	0.0	0.0		0.0	0.0	0.0	0.0
Diphyes antarctica	15.8		0.0	0.4	1.9	0.0	8.5		0.0	0.2	0.9	0.0
Hydromedusae	15.8		0.0	0.4	1.5	0.0	5.3		0.0	0.0	0.2	0.0
Bathylagus sp. (L)	3.2		0.0	0.3	2.6	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen kempi (L)	8.4		0.0	0.3	1.4	0.0	18.1		0.0	0.3	0.8	0.0
Modeeria rotunda?	2.1		0.0	0.2	2.2	0.0	2.1		0.0	0.0	0.2	0.0
Larvaceans	4.2		0.0	0.2	1.4	0.0	2.1		0.0	2.4	23.4	0.0
Amphipod	2.1		0.0	0.2	2.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella spp.	11.6		0.0	0.1	0.5	0.0	12.8		0.0	0.2	0.8	0.0
Notothenops nudifrons (L)	5.3		0.0	0.1	0.7	0.0	2.1		0.0	0.0	0.2	0.0
Mysids	3.2		0.0	0.1	0.9	0.0	2.1		0.0	0.1	1.0	0.0
Trematomus newnesi (L)	4.2		0.0	0.1	0.4	0.0	1.1		0.0	0.0	0.0	0.0
Chromatonema rubra?	2.1		0.0	0.1	0.4	0.0	3.2		0.0	0.3	2.3	0.0
Trematomus lepidorhinus (L)	1.1		0.0	0.1	0.5	0.0	0.0		0.0	0.0	0.0	0.0
Clio pyramidata antarctica?	2.1		0.0	0.0	0.4	0.0	4.3		0.0	0.1	0.5	0.0
Chionodraco rastrospinosus (L)	2.1		0.0	0.0	0.4	0.0	0.0		0.0	0.0	0.0	0.0
Pleurobrachia pileus	2.1		0.0	0.0	0.4	0.0	0.0		0.0	0.0	0.0	0.0

Table 4.3 (Contd.)

TAXON	SURVEY A AREA (N=95) F(%)	R	%	MEAN	STD	MEDIAN	SURVEY D AREA (N=94) F(%)	R	%	MEAN	STD	MEDIAN
Prionodraco evansii (J)	4.2		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Electrona carlsbergi	2.1		0.0	0.0	0.3	0.0	1.1		0.0	0.0	0.1	0.0
Pelagobia longicirrata	1.1		0.0	0.0	0.3	0.0	1.1		0.0	0.0	0.0	0.0
Schyphomedusae	2.1		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Cyllopus spp.	3.2		0.0	0.0	0.2	0.0	13.8		0.0	0.9	3.5	0.0
Electrona antarctica	3.2		0.0	0.0	0.2	0.0	12.8		0.0	0.1	0.5	0.0
Trematomus scotti (L)	1.1		0.0	0.0	0.3	0.0	4.3		0.0	0.0	0.2	0.0
Hyperiella macronyx	3.2		0.0	0.0	0.2	0.0	1.1		0.0	0.0	0.0	0.0
Electrona spp. (L)	3.2		0.0	0.0	0.2	0.0	20.2		0.0	2.2	17.0	0.0
Isopods	3.2		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Gastropods	2.1		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Vanadis antarctica	2.1		0.0	0.0	0.2	0.0	2.1		0.0	0.0	0.1	0.0
Calycopsis borchgrevinki	1.1		0.0	0.0	0.2	0.0	4.3		0.0	0.0	0.2	0.0
Orchomene plebs	1.1		0.0	0.0	0.2	0.0	2.1		0.0	0.0	0.2	0.0
Hyperiella antarctica	1.1		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Notolepis coatsi (L)	4.2		0.0	0.0	0.1	0.0	12.8		0.0	0.2	0.9	0.0
Sipunculids	3.2		0.0	0.0	0.1	0.0	4.3		0.0	1.5	9.1	0.0
Hyperia antarctica	1.1		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Clione antarctica	1.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen larseni (J)	1.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Siphonophora	2.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Ctenophora	1.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Staurophora mertensi ?	1.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (L)	1.1		0.0	0.0	0.1	0.0	5.3		0.0	0.2	1.0	0.0
Beroe cucumis	2.1		0.0	0.0	0.1	0.0	1.1		0.0	0.0	0.0	0.0
Notothenia spp. (L)	2.1		0.0	0.0	0.1	0.0	1.1		0.0	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	1.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Zanclonia weldoni?	2.1		0.0	0.0	0.1	0.0	6.4		0.0	0.0	0.2	0.0
Gammarids	1.1		0.0	0.0	0.1	0.0	4.3		0.0	2.3	21.9	0.0
Hyperoche medusarum	1.1		0.0	0.0	0.1	0.0	3.2		0.0	0.0	0.1	0.0
Artededraco mirus (L)	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pegantha martgon	1.1		0.0	0.0	0.0	0.0	3.2		0.0	0.1	0.7	0.0
Bolinopsis infundibulus	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Eusirus antarcticus	1.1		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.4	0.0
Schizobrachium polycotylum?	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Krefftichthys anderssoni (L)	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Parachaenechthys charcoti (L)	1.1		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.1	0.0
Gymnoscopelus braueri	1.1		0.0	0.0	0.0	0.0	6.4		0.0	0.1	0.3	0.0
Gymnoscopelus nicholsi	1.1		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.1	0.0
Electrona subaspera	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Spongiobranchaea sp.	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pasiaphaea sp. larvae	1.1		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Euphausia frigida (L)	---		---	---	---	---	19.1	11	0.2	53.4	203.1	0.0
E. crystallorophorias (L)	---		---	---	---	---	6.4		0.1	14.1	100.4	0.0
Euphausia triacantha (L)	---		---	---	---	---	1.1		0.0	0.8	8.1	0.0
Limacina spp.	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.2	2.2	0.0
Arctapodema ampla	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.1	0.8	0.0
Clytia sp.?	0.0		0.0	0.0	0.0	0.0	4.3		0.0	0.1	0.3	0.0
Cyphocaris richardi	0.0		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.3	0.0
Champsocephalus gunnari (L)	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.2	0.0
Harpagifer antarcticus (L)	0.0		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.2	0.0
Gerlache australis (L)	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.1	0.0
Atolla wyvillei	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.1	0.0
Cephalopods	0.0		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.1	0.0
Bolinopsis spp.	0.0		0.0	0.0	0.0	0.0	2.1		0.0	0.0	0.1	0.0
Trematomus centronotus (L)	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.1	0.0
Scina spp.	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.1	0.0
Pyrasoma atlanticum	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.0	0.0
Orchomene rossi	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.0	0.0
Mitrocomella brownei?	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.0	0.0
Bathydraco antarcticus (L)	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.0	0.0
Periphylla periphylla	0.0		0.0	0.0	0.0	0.0	1.1		0.0	0.0	0.0	0.0
TOTAL				11143.1	20915.5	3775.6				27261.0	47141.2	16157.8
TAXA	103			19.4	3.8	20	93			17.5	3.6	18

Table 4.4. Composition and abundance of zooplankton assemblages sampled in four subareas, January-March 2002 (Surveys A & D). F(%) is frequency of occurrence in samples. R is rank and % is percent of total mean abundance represented by each taxon. L and J denote larval and juvenile stages. Euphausia sp. larvae in Joinville Island area may be E. superba.

A. Survey A	WEST AREA (N=25)						ELEPHANT ISLAND AREA (N=44)						JOINVILLE ISLAND AREA (N=9)						SOUTH AREA (N=17)					
TAXON	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN
Copepods	100.0	1	66.7	16970.4	18426.5	12488.0	100.0	1	73.5	5484.3	14585.6	2174.9	100.0	1	37.1	1556.3	1609.0	1288.3	100.0	1	64.8	2138.9	2801.1	895.0
Calanoides acutus	100.0		33.9	8619.4	9452.8	5643.6	97.7		39.3	2931.3	8293.0	876.4	100.0		17.3	725.1	611.0	661.8	100.0		24.4	805.3	1373.2	129.3
Calanus propinquus	100.0		19.1	4862.7	5064.8	3385.9	100.0		25.0	1862.2	5659.2	502.7	100.0		7.6	318.4	251.7	184.0	100.0		21.6	712.2	1368.2	124.8
Metridia gerlachei	92.0		6.3	1606.0	3399.6	326.4	77.3		4.7	350.8	467.6	130.3	100.0		9.7	407.1	808.5	38.0	76.5		9.9	326.5	620.5	48.1
Rhincalanus gigas	76.0		2.7	685.6	1100.9	88.8	63.6		1.9	141.6	381.0	16.4	22.2		0.6	23.9	65.3	0.0	47.1		3.0	99.5	316.0	0.0
Other copepods	92.0		3.0	769.8	1236.8	380.8	54.5		0.6	44.2	89.0	11.0	22.2		0.1	4.5	8.7	0.0	47.1		2.5	84.1	159.5	0.0
Pareuchaeta antarctica	88.0		1.6	412.0	556.9	232.1	84.1		1.6	122.7	185.6	57.7	77.8		1.8	73.9	84.0	28.5	76.5		1.9	62.1	82.2	17.0
Copepodites	8.0		0.0	9.8	39.3	0.0	11.4		0.4	30.1	154.1	0.0	0.0		0.0	0.0	0.0	0.0	17.6		0.3	9.9	24.7	0.0
Pleuromama robusta	4.0		0.0	3.8	18.4	0.0	6.8		0.0	1.4	6.3	0.0	11.1		0.1	3.4	9.7	0.0	17.6		0.9	28.7	107.7	0.0
Pareuchaeta similius	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.3	10.5	41.9	0.0
Eucalanus sp.	4.0		0.0	1.4	6.7	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Thysanoessa macrura (L)	100.0	2	15.6	3973.5	3831.6	3082.3	97.7	2	10.4	773.3	1379.1	181.7	100.0		2.0	85.4	80.2	57.3	52.9		2.7	90.7	216.5	1.6
Radiolarians	48.0	3	13.8	3523.1	9054.8	0.0	45.5	4	2.9	216.5	1298.4	0.0	44.4		0.2	6.4	11.1	0.0	23.5		0.4	12.4	43.4	0.0
Salpa thompsoni	96.0	7	0.4	92.8	142.7	39.0	90.9	3	5.5	410.0	614.6	85.8	55.6	4	4.4	183.6	367.7	1.5	88.2	3	6.1	201.2	378.1	71.4
Thysanoessa macrura	80.0	5	1.0	252.8	853.1	19.6	97.7	5	2.7	200.9	784.8	33.1	88.9		0.9	39.2	55.8	5.6	100.0	2	10.0	331.3	397.7	176.5
Chaetognaths	84.0	4	1.3	324.8	521.7	156.3	81.8	6	1.9	139.8	221.1	76.6	66.7		0.6	25.5	50.0	6.9	82.4	5	3.1	102.1	139.6	47.2
Ostracods	16.0	10	0.1	19.5	64.9	0.0	18.2		0.1	6.9	22.4	0.0	55.6	2	24.2	1013.3	2852.5	0.4	58.8		1.1	37.4	95.8	7.0
Euphausia spp. (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	100.0	3	23.5	984.6	2478.1	68.9	11.8		0.0	1.1	3.0	0.0
Euphausia superba	60.0	9	0.2	42.0	141.2	0.4	88.6	7	0.5	39.0	93.3	7.5	66.7		1.9	78.3	153.4	10.3	64.7	4	4.9	161.7	390.5	0.8
Clio pyramidata sulcata	92.0	6	0.5	134.4	166.5	60.0	84.1	9	0.4	33.1	73.0	6.5	55.6		0.1	2.5	3.6	1.0	41.2		0.4	13.8	28.9	0.0
Themisto gaudichaudii	100.0	8	0.3	77.4	79.0	48.7	100.0		0.3	23.1	30.5	12.3	22.2		0.1	2.7	6.4	0.0	64.7		0.2	6.5	9.0	1.8
Euphausia frigida	44.0		0.0	6.9	11.4	0.0	50.0	10	0.4	28.0	56.1	0.4	0.0		0.0	0.0	0.0	0.0	41.2		1.0	31.9	108.5	0.0
Euphausia superba (L)	4.0		0.0	1.5	7.6	0.0	47.7	8	0.5	35.8	64.6	0.0	---		---	---	---	---	29.4		0.4	13.4	30.3	0.0
Euphausia crystallorophorias	4.0		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	33.3		0.1	2.8	5.1	0.0	47.1		2.7	90.4	256.9	0.0
Decapods	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	66.7	5	3.4	140.9	393.0	0.5	17.6		0.1	3.4	12.6	0.0
Eggs (unid.)	0.0		0.0	0.0	0.0	0.0	2.3		0.3	21.1	138.4	0.0	11.1		0.1	3.8	10.7	0.0	0.0		0.0	0.0	0.0	0.0
Polychaetes	4.0		0.0	0.2	0.9	0.0	6.8		0.1	8.1	40.5	0.0	66.7		0.2	9.7	17.7	0.5	29.4		0.3	10.7	22.9	0.0
Primno macropa	32.0		0.0	1.9	6.7	0.0	61.4		0.1	9.1	19.6	0.9	33.3		0.0	0.6	1.0	0.0	70.6		0.3	8.8	14.6	2.6
Vibilia antarctica	52.0		0.0	1.2	1.7	0.4	72.7		0.1	4.6	9.1	1.6	66.7		0.2	9.4	13.6	2.5	70.6		0.1	2.8	3.5	1.3
Lepidonotothen larseni (L)	12.0		0.0	0.4	1.9	0.0	6.8		0.0	1.2	7.7	0.0	44.4		0.1	3.6	6.0	0.0	47.1		0.5	15.6	44.0	0.0
Larval Fish (unid.)	8.0		0.0	12.3	44.9	0.0	9.1		0.0	0.1	0.4	0.0	11.1		0.0	0.2	0.5	0.0	5.9		0.0	0.1	0.2	0.0
Cyllopus magellanicus	40.0		0.0	0.6	1.1	0.0	56.8		0.1	6.6	16.6	0.4	11.1		0.0	0.3	0.8	0.0	35.3		0.0	0.2	0.3	0.0
Tomopteris spp.	64.0		0.0	2.4	3.4	1.3	50.0		0.0	2.1	4.3	0.2	33.3		0.1	5.2	9.7	0.0	17.6		0.2	5.2	20.5	0.0
Cumaceans	4.0		0.0	0.0	0.2	0.0	2.3		0.1	5.8	38.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Clione limacina	52.0		0.0	4.3	9.2	0.8	34.1		0.0	2.2	8.2	0.0	55.6		0.0	0.4	0.5	0.4	29.4		0.0	0.5	1.1	0.0
Spongiobranchaea australis	88.0		0.0	3.8	4.7	1.8	63.6		0.0	1.4	1.9	0.5	66.7		0.0	1.0	0.9	0.9	58.8		0.0	1.0	1.1	0.5
Decapods (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.3	11.5	32.5	0.0	11.8		0.1	3.2	9.1	0.0
Acanthophyra pelagica	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.3	8.4	33.7	0.0
Cyllopus lucasii	44.0		0.0	2.4	5.0	0.0	43.2		0.0	1.5	4.2	0.0	11.1		0.0	0.3	0.7	0.0	11.8		0.0	0.3	1.0	0.0
Hyperiella dilatata	60.0		0.0	0.8	0.9	0.7	45.5		0.0	1.1	2.4	0.0	44.4		0.0	1.5	3.6	0.0	70.6		0.1	2.4	4.5	1.1
Ihlea racovitzai	4.0		0.0	0.1	0.3	0.0	15.9		0.0	1.5	5.5	0.0	44.4		0.1	4.4	7.2	0.0	0.0		0.0	0.0	0.0	0.0
Euphausia triacantha	4.0		0.0	0.1	0.3	0.0	13.6		0.0	1.8	5.9	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Crustacean larvae	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.2	8.5	24.1	0.0	0.0		0.0	0.0	0.0	0.0
Limacina helicina	12.0		0.0	0.5	1.6	0.0	4.5		0.0	0.3	2.0	0.0	33.3		0.0	1.1	1.8	0.0	23.5		0.1	2.3	7.1	0.0
Dimophyes arctica	4.0		0.0	1.4	6.8	0.0	11.4		0.0	0.2	0.6	0.0	44.4		0.0	0.9	1.5	0.0	17.6		0.0	0.2	0.4	0.0
Hyperiids	8.0		0.0	0.1	0.2	0.0	2.3		0.0	0.9	5.8	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.7	2.7	0.0
Diphyes antarctica	0.0		0.0	0.0	0.0	0.0	18.2		0.0	0.3	0.6	0.0	33.3		0.0	0.5	0.7	0.0	23.5		0.0	1.3	4.3	0.0
Hydromedusae	20.0		0.0	0.2	0.6	0.0	15.9		0.0	0.3	0.8	0.0	33.3		0.0	2.0	3.9	0.0	0.0		0.0	0.0	0.0	0.0
Bathylagus sp. (L)	4.0		0.0	0.0	0.1	0.0	2.3		0.0	0.6	3.8	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.2	0.0
Lepidonotothen kempi (L)	4.0		0.0	0.4	1.8	0.0	11.4		0.0	0.3	1.6	0.0	0.0		0.0	0.0	0.0	0.0	11.8		0.0	0.1	0.4	0.0
Modeeria rotunda?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	22.2		0.1	2.6	6.5	0.0	0.0		0.0	0.0	0.0	0.0
Larvaceans	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.3	0.0	33.3		0.1	2.2	4.1	0.0	0.0		0.0	0.0	0.0	0.0
Amphipod	4.0		0.0	0.8	3.8	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella spp.	24.0		0.0	0.3	0.7	0.0	6.8		0.0	0.1	0.3	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.1	0.6	0.0

Table 4.4 (Contd.)

TAXON	WEST AREA (N=25) F(%)	R	%	MEAN	STD	MEDIAN	ELEPHANT ISLAND AREA (N=44) F(%)	R	%	MEAN	STD	MEDIAN	JOINVILLE ISLAND AREA (N=9) F(%)	R	%	MEAN	STD	MEDIAN	SOUTH AREA (N=17) F(%)	R	%	MEAN	STD	MEDIAN
Notothenops nudifrons (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	33.3		0.0	0.8	1.8	0.0	11.8		0.0	0.3	0.8	0.0
Mysids (unid.)	8.0		0.0	0.4	1.7	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Trematomus newnesi (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.3	0.8	0.0	17.6		0.0	0.2	0.5	0.0
Chromatonema rubra?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	22.2		0.0	0.6	1.3	0.0	0.0		0.0	0.0	0.0	0.0
Trematomus lepidorhinus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.6	1.6	0.0	0.0		0.0	0.0	0.0	0.0
Clio pyramidata antarctica?	4.0		0.0	0.0	0.2	0.0	2.3		0.0	0.1	0.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Chionodraco rastrospinosus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.4	1.2	0.0	5.9		0.0	0.0	0.1	0.0
Pleurobrachia pileus	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.1	0.5	0.0	11.1		0.0	0.1	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Prionodraco evansii (J)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	44.4		0.0	0.4	0.6	0.0	0.0		0.0	0.0	0.0	0.0
Electrona carlsbergi	4.0		0.0	0.1	0.4	0.0	2.3		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pelagobia longicirrata	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.1	0.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Schyphomedusae	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	11.1		0.0	0.2	0.6	0.0	0.0		0.0	0.0	0.0	0.0
Cyllopus spp.	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.2	0.0
Electrona antarctica	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Trematomus scotti (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.3	0.8	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella macronyx	8.0		0.0	0.0	0.1	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona spp. (L)	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.4	0.0
Isopods (unid.)	4.0		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	22.2		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0
Gastropods (unid.)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.1	0.4	0.0
Vanadis antarctica	4.0		0.0	0.1	0.3	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Calycopsis borchgrevinki	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Orchomene plebs	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.4	0.0
Hyperiella antarctica	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Notolepis coatsi (L)	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	11.8		0.0	0.0	0.1	0.0
Sipunculids	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	11.8		0.0	0.1	0.2	0.0
Hyperia antarctica	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.2	0.5	0.0	0.0		0.0	0.0	0.0	0.0
Clione antarctica	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.2	0.5	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen larseni (J)	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Siphonophora	4.0		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.2	0.0
Ctenophora	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.3	0.0
Staurophora mertensi ?	4.0		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0
Beroe cucumis	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.2	0.0	5.9		0.0	0.0	0.1	0.0
Notothenia spp. (L)	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0
Zanclonia weldoni?	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gammarids	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.2	0.0
Hyperoche medusarum	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.2	0.0
Artededraco mirus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.2	0.0	0.0		0.0	0.0	0.0	0.0
Peagantha martgon	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Bolinopsis infundibulus	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Eusirus antarcticus	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Schizobrachium polycotylum?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Krefftichthys anderssoni (L)	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Parachaenechthys charcoti (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus braueri	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus nicholsi	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Electrona subaspera	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pasiaphaea sp. (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Spongiobranchaea sp.	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
TOTAL				25453.9	29050.3	14577.2				7462.7	17001.6	3551.5				4195.9	6715.7	1746.6				3301.3	2876.0	2313.3
TAXA				18.8	3.6	19				19.2	3.8	20				22.6	3.7	24				19.0	3.3	19

Table 4.4 (Contd.)

B. Survey D	WEST AREA (N=24)						ELEPHANT ISLAND AREA (N=44)						JOINVILLE ISLAND AREA (N=9)						SOUTH AREA (N=17)					
TAXON	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN	F(%)	R	%	MEAN	STD	MEDIAN
Copepods	100.0	1	60.3	24521.9	37120.5	12471.1	100.0	1	54.7	17473.4	20036.9	7563.8	100.0	1	90.5	6448.4	3618.1	6265.5	100.0	1	68.8	4686.1	4924.5	2182.8
Calanoides acutus	100.0		23.2	9419.8	13322.8	5327.0	100.0		29.9	9569.2	12553.1	4585.6	100.0		31.0	2210.5	1767.6	1497.5	100.0		22.6	1543.5	2090.2	344.8
Calanus propinquus	100.0		21.5	8766.1	15259.8	1917.1	100.0		12.0	3827.4	4288.9	2037.2	100.0		10.3	735.0	406.7	656.9	100.0		18.1	1232.0	1487.5	426.9
Rhincalanus gigas	91.7		6.4	2598.6	4683.9	653.1	95.5		3.8	1226.4	1952.7	246.2	22.2		0.2	13.3	26.9	0.0	76.5		1.6	109.8	167.3	47.7
Metridia gerlachei	87.5		7.5	3059.2	3926.1	1956.5	95.5		7.9	2515.1	3124.5	1183.6	100.0		48.3	3438.3	4079.7	1439.5	100.0		24.4	1661.2	2402.8	287.9
Pareuchaeta antarctica	62.5		0.5	185.4	230.7	91.8	68.2		0.5	169.3	269.2	52.5	66.7		0.7	51.3	57.7	31.6	88.2		1.8	124.0	170.1	52.3
Other copepods	29.2		0.5	214.9	454.0	0.0	25.0		0.4	116.0	337.2	0.0	0.0		0.0	0.0	0.0	0.0	29.4		0.1	6.8	12.9	0.0
Copepodites	29.2		0.2	85.8	186.5	0.0	6.8		0.0	5.2	22.5	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	3.0	11.8	0.0
Pleuromama robusta	16.7		0.4	180.2	482.5	0.0	11.4		0.1	30.0	97.2	0.0	0.0		0.0	0.0	0.0	0.0	17.6		0.1	5.8	14.7	0.0
Haloptilus ocellatus	4.2		0.0	11.9	57.1	0.0	6.8		0.0	14.8	66.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Thysanoessa macrura (L)	100.0	3	3.9	1568.8	2229.0	256.2	95.5	3	4.5	1444.9	2665.1	364.0	100.0	3	2.0	141.7	187.6	75.4	94.1		1.7	116.6	102.4	95.3
Themisto gaudichaudii	100.0		0.1	53.7	66.6	22.7	100.0		0.1	24.8	23.5	15.9	77.8		0.1	7.5	8.9	3.5	100.0		0.3	22.9	20.5	18.6
Chaetognaths	95.8	5	2.7	1107.4	1403.6	405.9	100.0	4	3.4	1073.1	1210.4	435.6	100.0	4	1.9	133.1	109.1	98.5	94.1	3	6.7	455.1	532.1	183.6
Salpa thompsoni	75.0	4	3.0	1216.8	2337.9	24.3	90.9	5	1.8	570.4	782.3	250.9	77.8	2	2.3	163.5	234.0	2.1	64.7		2.3	156.7	502.4	8.2
Thysanoessa macrura	66.7	9	0.3	105.0	188.9	25.1	77.3	8	0.2	56.4	132.5	3.5	100.0	5	1.8	127.2	201.3	61.9	94.1	5	3.8	262.4	449.4	95.5
Euphausia frigida	62.5	7	0.4	150.3	529.1	12.3	70.5	7	0.2	78.4	192.3	5.1	88.9		0.3	20.6	21.1	8.9	47.1		0.2	16.2	48.7	0.0
Primno macropa	62.5		0.1	23.1	39.5	2.0	65.9	10	0.1	43.4	131.2	1.8	11.1		0.0	0.0	0.1	0.0	52.9		0.2	10.8	23.4	0.4
Spongiobranchaea australis	58.3		0.0	2.8	5.7	0.4	47.7		0.0	0.9	1.3	0.0	44.4		0.0	0.3	0.4	0.0	35.3		0.0	0.6	1.1	0.0
Euphausia superba	45.8	6	1.7	694.4	2317.5	0.0	54.5		0.0	10.1	25.4	0.4	88.9		0.1	4.3	5.4	1.7	64.7	2	8.0	548.1	1765.6	6.4
Vibilia antarctica	41.7		0.1	20.3	46.5	0.0	61.4		0.1	34.2	129.0	0.6	33.3		0.0	2.7	5.0	0.0	23.5		0.1	4.0	13.5	0.0
Cyllopus lucasii	41.7		0.0	9.5	21.3	0.0	31.8		0.0	1.1	2.7	0.0	22.2		0.0	0.4	0.7	0.0	17.6		0.0	0.3	0.9	0.0
Hyperiella dilatata	41.7		0.0	3.7	7.9	0.0	36.4		0.0	2.8	9.7	0.0	33.3		0.0	2.7	6.4	0.0	41.2		0.0	0.5	1.1	0.0
Radiolarians	33.3	2	26.9	10954.0	27416.2	0.0	54.5	2	34.2	10941.0	32920.3	32.5	11.1		0.0	0.0	0.1	0.0	5.9		0.0	1.3	5.0	0.0
Euphausia triacantha	33.3		0.0	4.9	8.6	0.0	27.3		0.0	1.9	4.6	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.4	1.5	0.0
Cyllopus magellanicus	33.3		0.0	3.8	12.3	0.0	50.0		0.0	3.8	11.6	0.2	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.0	0.1	0.0
Euphausia superba (L)	29.2	8	0.3	133.7	380.9	0.0	29.5	9	0.2	49.9	140.9	0.0	44.4		0.4	29.2	38.4	0.0	17.6		0.1	4.0	10.9	0.0
Lepidonotothen kempi (L)	29.2		0.0	0.4	1.0	0.0	13.6		0.0	0.2	0.6	0.0	0.0		0.0	0.0	0.0	0.0	23.5		0.0	0.4	0.7	0.0
Notolepis coatsi (L)	25.0		0.0	0.4	1.6	0.0	13.6		0.0	0.2	0.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ostracods	20.8	10	0.2	64.3	136.5	0.0	13.6		0.0	13.4	47.6	0.0	11.1		0.1	9.0	25.6	0.0	52.9		1.5	105.4	180.9	8.3
Electrona spp. (L)	20.8		0.0	0.2	0.6	0.0	25.0		0.0	4.4	24.6	0.0	11.1		0.0	0.2	0.5	0.0	11.8		0.0	0.4	1.1	0.0
Tomopteris spp.	16.7		0.0	1.4	4.8	0.0	25.0		0.0	1.6	3.8	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.0	0.1	0.0
Electrona antarctica	12.5		0.0	0.3	0.8	0.0	9.1		0.0	0.1	0.2	0.0	33.3		0.0	0.1	0.2	0.0	11.8		0.0	0.1	0.3	0.0
Cyllopus spp.	8.3		0.0	0.4	1.3	0.0	22.7		0.0	1.6	4.9	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Pegantha margaton	8.3		0.0	0.3	1.3	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Clio pyramidata antarctica	8.3		0.0	0.2	0.8	0.0	4.5		0.0	0.1	0.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gymnoscopelus braueri	8.3		0.0	0.1	0.4	0.0	4.5		0.0	0.0	0.1	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.0	0.1	0.0
Diphyes antarctica	8.3		0.0	0.1	0.4	0.0	6.8		0.0	0.3	1.2	0.0	22.2		0.0	0.1	0.2	0.0	5.9		0.0	0.0	0.1	0.0
Euphausia frigida (L)	4.2		0.0	18.3	87.8	0.0	20.5	6	0.3	84.6	278.9	0.0	11.1		0.1	4.3	12.1	0.0	41.2		0.7	48.1	101.3	0.0
E. crystallorophorias (L)	4.2		0.0	14.5	69.6	0.0	4.5		0.1	21.4	136.8	0.0	11.1		0.0	0.0	0.1	0.0	11.8		0.0	1.8	6.2	0.0
Euphausia triacantha (L)	4.2		0.0	3.3	15.8	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Arctapodema ampla	4.2		0.0	0.3	1.6	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella spp.	4.2		0.0	0.3	1.5	0.0	15.9		0.0	0.1	0.4	0.0	11.1		0.0	0.0	0.1	0.0	17.6		0.0	0.1	0.2	0.0
Limacina helicina	4.2		0.0	0.3	1.5	0.0	2.3		0.0	0.1	0.4	0.0	33.3		0.1	5.1	10.6	0.0	0.0		0.0	0.0	0.0	0.0
Clione limacina	4.2		0.0	0.2	0.7	0.0	2.3		0.0	0.1	0.9	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.0	0.1	0.0
Hydromedusae	4.2		0.0	0.0	0.2	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.2	0.5	0.0	17.6		0.0	0.1	0.2	0.0
Electrona carlsbergi	4.2		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Scina spp.	4.2		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Zanclonia weldoni?	4.2		0.0	0.0	0.1	0.0	11.4		0.0	0.1	0.2	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Vanadis antarctica	4.2		0.0	0.0	0.1	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Lepidonotothen larseni (L)	4.2		0.0	0.0	0.1	0.0	2.3		0.0	0.0	0.1	0.0	44.4		0.0	1.0	1.4	0.0	29.4		0.1	9.1	34.8	0.0
Hyperoche medusarum	4.2		0.0	0.0	0.1	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Modeeria rotunda?	4.2		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.2	0.7	0.0	0.0		0.0	0.0	0.0	0.0
Periphylla periphylla	4.2		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0

Table 4.4 (Contd.)

TAXON	WEST AREA (N=24) F(%)	R	%	MEAN	STD	MEDIAN	ELEPHANT ISLAND AREA (N=44) F(%)	R	%	MEAN	STD	MEDIAN	JOINVILLE ISLAND AREA (N=9) F(%)	R	%	MEAN	STD	MEDIAN	SOUTH AREA (N=17) F(%)	R	%	MEAN	STD	MEDIAN
Clio pyramidata sulcata	0.0		0.0	0.0	0.0	0.0	9.1		0.0	0.3	1.3	0.0	11.1		0.0	0.2	0.6	0.0	0.0		0.0	0.0	0.0	0.0
Calycopsis borchgrevinki	0.0		0.0	0.0	0.0	0.0	9.1		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Gammarids	0.0		0.0	0.0	0.0	0.0	6.8		0.0	4.9	31.8	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.3	0.0
Euphausia spp. (L)	0.0		0.0	0.0	0.0	0.0	6.8		0.0	9.4	49.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Dimophyes arctica	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.1	0.5	0.0	33.3		0.0	0.7	1.7	0.0	17.6		0.0	0.1	0.2	0.0
Orchomene plebs	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.1	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Mysids	0.0		0.0	0.0	0.0	0.0	4.5		0.0	0.3	1.5	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Ihlea racovitzai	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.3	2.1	0.0	44.4		0.0	1.4	2.0	0.0	0.0		0.0	0.0	0.0	0.0
Sipunculids	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	22.2		0.2	13.1	25.7	0.0	5.9		0.0	1.3	5.0	0.0
Larvaceans	0.0		0.0	0.0	0.0	0.0	2.3		0.0	5.2	33.9	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Euphausia crystallorophorias	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	58.8	4	5.3	360.9	1065.4	14.2
Eusirus antarcticus	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.2	0.8	0.0
Cephalopods	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Champsocephalus gunnari (L)	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.3	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Hyperiella macronyx	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Acanthophyra pelagica	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.1	0.4	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Larval Fish	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Beroe cucumis	0.0		0.0	0.0	0.0	0.0	2.3		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Pleuragramma antarcticum (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	55.6		0.0	1.9	2.6	0.4	0.0		0.0	0.0	0.0	0.0
Trematomus scotti (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	44.4		0.0	0.4	0.4	0.0	0.0		0.0	0.0	0.0	0.0
Clytia ?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	22.2		0.0	0.4	0.8	0.0	11.8		0.0	0.1	0.4	0.0
Chromatonema rubra?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	22.2		0.0	2.6	7.0	0.0	5.9		0.0	0.0	0.2	0.0
Leptonotothen nudifrons (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.2	0.6	0.0	5.9		0.0	0.1	0.3	0.0
Gymnoscopelus nicholsi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.3	0.0	5.9		0.0	0.0	0.1	0.0
Bolinopsis spp.	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.0	0.1	0.0
Harpagifer antarcticus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	5.9		0.0	0.1	0.4	0.0
Pelagobia longicirrata	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Orchomene rossi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Trematomus newnesi (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Pyrasoma atlanticum	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Atolla wyvillei	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.1	0.4	0.0	0.0		0.0	0.0	0.0	0.0
Mitrocomella brownei?	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Bathydraco antarcticus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.1		0.0	0.0	0.1	0.0	0.0		0.0	0.0	0.0	0.0
Cyphocaris richardi	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	11.8		0.0	0.2	0.6	0.0
Notolepis spp. (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Limacina spp.	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	1.3	5.0	0.0
Trematomus centronotus (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Parachaenechthys charcoti (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Polychaetes	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.0	0.1	0.0
Gerlache australis (L)	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	5.9		0.0	0.1	0.3	0.0
TOTAL				40679.8	64362.2	27851.0				31959.5	45889.6	19541.7				7123.5	3919.2	12917.7				6816.1	6094.5	4238.1
TAXA				16.8	3.7	18				17.8	3.3	18				18.7	3.4	19				17.2	4.0	17.0

Table 4.5. Larval krill stage composition in (A) Large Survey areas, 1996-2002, and (B) total and individual areas, 2000-2002. Only pooled calyptopis and furcilia stages provided for 1996-1999. Individual stages provided for 2000-2002 surveys. Shaded area denotes stage composition of Euphausia spp. larvae in the A02 Joinville Island area.

(A) Large Survey Area

Stage %	A96	D96	A97	D97	A98	D98	A99	D99	D00	A01	D01	A02	D02
Calyptopis Total	100	86	93	100	68	99	100	97	97	100	98	70	85
Furcilia Total	---	14	7	---	32	1	---	3	3	---	2	30	15

(B) Total, Elephant Island, West, South and Joinville Island Areas

Survey	D00				A01				D01			
Stage %	Total	Eleph	West	South	Total	Eleph	West	South	Total	Eleph	West	South
C1	46.3	46.3	48.8	32.6	24.0	68.4	17.6	95.3	57.1	58.4	37.6	17.8
C2	40.5	40.5	29.3	55.2	66.3	22.1	72.7	---	29.8	29.4	36.1	15.2
C3	9.9	9.8	21.1	12.2	9.7	9.3	9.7	---	11.2	10.7	18.0	67.0
Unid.	0.6	0.6	---	---	---	0.2	---	4.7	---	---	0.8	---
Calyptopis Total	96.9	96.9	99.2	100	100	100	100	100	98.2	98.6	92.5	100
F1	1.4	1.4	0.8	---	---	---	---	---	1.8	1.4	7.4	---
F2	1.2	1.2	---	---	---	---	---	---	---	---	0.1	---
F3	0.1	0.1	---	---	---	---	---	---	---	---	---	---
Unid.	---	---	---	---	---	---	---	---	---	---	---	---
Furcilia Total	2.7	2.7	0.8	---	---	---	---	---	1.8	1.4	7.5	---

Survey	A02					D02				
Stage %	Total	Eleph	West	South	Joinvl	Total	Eleph	West	South	Joinvl
C1	37.3	40.3	50.0	13.9	5.0	18.5	42.2	3.2	50.3	---
C2	15.8	16.3	50.0	7.0	2.9	12.1	4.1	16.7	49.7	15.6
C3	17.4	20.3	---	---	52.5	49.5	23.5	70.0	---	29.5
Unid.	---	---	---	---	---	5.3	---	9.5	---	---
Calyptopis Total	70.5	76.9	100	20.9	60.4	85.5	69.8	99.3	100	45.1
F1	9.6	6.2	---	35	38.2	10.4	22.8	0.7	---	26.8
F2	19.9	17.0	---	44.1	1.4	3.4	7.4	---	---	12.1
F3	---	---	---	---	---	0.7	---	---	---	16.1
Unid.	---	---	---	---	---	---	---	---	---	---
Furcilia Total	29.5	23.1	---	79.1	39.6	14.5	30.2	0.7	---	54.9

Table 4.6. Taxonomic composition of three zooplankton clusters during January 2002 Survey A. R and % are rank and proportion of total mean abundance represented by each taxon.

	CLUSTER 3 (OCEANIC) N=15					CLUSTER 2 (SHELF) N=41					CLUSTER 1 (COASTAL) N=39				
TAXON	R	%	MEAN	STD	MEDIAN	R	%	MEAN	STD	MEDIAN	R	%	MEAN	STD	MEDIAN
Calanoides acutus	1	34.4	14078.6	15314.1	7806.2	1	42.4	3076.9	3800.2	1335.1	1	21.1	701.3	1200.3	241.8
Calanus propinquus	2	21.5	8795.5	9407.1	6538.9	2	25.2	1829.7	2203.6	787.7	5	8.9	295.5	467.9	138.0
Radiolarians	3	15.8	6474.7	10977.1	978.3	15	0.1	9.4	25.5	0.0		0.3	9.4	31.6	0.0
Thysanoessa macrura (L)	4	12.5	5121.7	4255.2	4501.0	3	17.9	1297.1	1813.2	262.4	7	4.4	145.2	282.3	28.1
Metridia gerlachei	5	5.8	2379.8	4170.9	513.2	4	4.0	288.1	500.4	68.6	3	13.4	443.3	659.3	131.2
Rhincalanus gigas	6	2.9	1199.1	1265.8	610.4	7	1.5	106.1	229.3	21.8	11	2.3	75.5	267.4	0.0
Other copepods	7	2.4	983.0	1502.6	380.8	6	1.5	112.1	207.4	25.1	9	2.6	85.1	283.1	0.0
Pareuchaeta antarctica	8	1.6	660.2	616.7	376.1	9	1.4	104.4	163.5	46.2	10	2.5	82.9	103.2	30.1
Chaetognaths	9	1.4	557.5	642.2	372.8	5	1.8	134.0	144.6	103.4	12	1.8	60.9	101.4	15.9
Salpa thompsoni	10	0.7	279.7	376.3	115.3	8	1.4	104.6	267.9	10.9	4	13.1	434.6	626.9	180.7
Clio pyramidata sulcata	11	0.5	213.6	176.6	192.0	11	0.5	39.8	73.2	9.4		0.2	6.0	13.0	1.8
Themisto gaudichaudii	12	0.2	85.6	93.2	45.5	12	0.4	32.3	41.1	15.6	15	0.4	12.3	19.3	4.1
Ostracods	13	0.1	35.1	81.3	0.0		0.1	4.3	20.9	0.0	6	7.6	252.4	1433.8	0.0
Thysanoessa macrura	14	0.0	16.6	37.2	1.6	10	1.0	74.5	117.6	19.6	2	13.8	457.5	1065.6	169.4
Euphausia frigida	15	0.0	9.6	15.2	0.0		0.1	3.8	9.2	0.0	13	1.3	42.3	90.1	1.6
Spongiobranchaea australis		0.0	4.9	3.4	3.4		0.0	1.8	3.4	0.9		0.0	0.9	1.2	0.4
Clione limacina		0.0	4.7	8.4	1.7		0.0	3.4	9.8	0.0		0.0	0.3	0.6	0.0
Tomopteris spp.		0.0	4.7	5.4	2.8		0.0	3.6	13.6	0.0		0.1	1.8	5.2	0.0
Primno macropa		0.0	4.0	11.7	0.0	14	0.1	10.1	21.3	0.5		0.1	3.3	5.4	0.4
Cyllopus magellanicus		0.0	2.6	3.3	1.3		0.0	1.6	5.0	0.0		0.2	5.3	17.2	0.0
Cyllopus lucasii		0.0	1.9	2.4	1.2		0.0	1.3	4.0	0.0		0.0	1.3	4.3	0.0
Vibilia antarctica		0.0	1.8	1.8	1.5		0.0	0.8	1.4	0.0		0.2	7.9	11.2	4.4
Hyperiella dilatata		0.0	1.5	1.0	1.7		0.0	1.2	2.9	0.4		0.0	1.3	3.2	0.0
Euphausia superba		0.0	1.1	2.3	0.0	13	0.2	13.5	25.8	2.6	8	4.4	144.9	297.1	8.4
Limacina helicina		0.0	0.7	2.0	0.0		0.0	1.2	5.1	0.0		0.0	0.4	1.4	0.0
Diphyes antarctica		0.0	0.2	0.5	0.0		0.0	0.1	0.3	0.0		0.0	0.8	2.9	0.0
Ihlea racovitzai		0.0	0.1	0.4	0.0		0.0	0.5	3.2	0.0		0.1	2.2	6.1	0.0
Euphausia crystallophorias		0.0	0.0	0.0	0.0		0.0	0.1	0.5	0.0	14	1.2	39.9	175.3	0.0
Dimophyes arctica		0.0	0.0	0.0	0.0		0.0	0.0	0.1	0.0		0.0	1.3	5.5	0.0
TOTAL			40918.3					7256.2					3315.8		

Table 4.7. Abundance of krill and other dominant zooplankton taxa collected in the Elephant Island area during January-February and February-March surveys, 1992-2002. Zooplankton data are not available for February-March 1992 or January 2000.

	Euphausia superba										
	January-February										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	63	70	63	71	72	71	61	40		60	44
Mean	23.7	28.8	34.5	9.5	82.1	29.6	27.1	5.3	n.a.	18.9	39.0
SD	78.0	64.4	94.2	20.6	245.1	80.5	42.3	8.1	n.a.	32.7	93.3
Med	5.7	8.2	3.1	3.6	11.4	5.6	10.2	1.7	n.a.	6.0	7.5
Max	594.1	438.9	495.9	146.1	1500.6	483.2	175.0	35.1	n.a.	217.7	458.6
	February-March										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	67	67	70	71	72	16	61	39	60	57	44
Mean	38.0	35.0	17.1	5.2	133.2	30.4	162.6	35.5	14.4	80.5	10.0
SD	77.4	89.7	63.5	12.0	867.7	56.4	768.3	155.7	35.3	374.0	25.5
Med	7.1	3.0	0.4	1.2	4.1	4.6	4.5	0.8	3.3	4.6	0.4
Max	389.9	542.0	371.1	90.0	7385.4	204.2	5667.0	978.6	253.5	2817.0	112.1

	Thysanoessa macrura										
	January-February										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	63	70	63	71	72	71	61	40		60	44
	48.1	48.6	74.6	104.1	103.4	101.0	135.3	46.6	n.a.	46.2	200.9
	57.0	60.1	144.3	231.9	118.1	127.2	150.8	54.1	n.a.	49.2	784.8
	22.5	27.5	25.4	36.1	52.3	52.8	98.0	23.2	n.a.	32.2	33.1
	233.7	307.1	901.6	1859.0	500.1	616.2	992.3	215.8	n.a.	251.7	5302.0
	February-March										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
		67	70	71	72	16	61	39	60	57	44
	n.a.	128.9	77.1	79.7	116.1	181.3	140.6	95.2	35.1	1040.9	56.4
	n.a.	235.1	132.6	138.5	147.4	168.0	232.3	131.9	61.5	7262.6	132.5
	n.a.	22.1	23.8	22.2	53.6	122.6	70.0	18.0	14.0	44.1	3.5
	n.a.	1141.5	815.9	664.9	679.4	538.9	1638.5	589.2	291.6	55381.1	662.7

	Salpa thompsoni										
	January-February										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	63	70	63	71	72	71	61	40		60	44
Mean	94.3	1213.4	931.9	20.2	25.5	223.2	939.7	197.5	n.a.	622.8	410.0
SD	192.3	2536.7	950.2	46.5	36.3	338.4	1556.3	191.6	n.a.	576.4	614.6
Med	14.0	245.8	582.3	1.6	10.5	87.1	348.9	159.1	n.a.	449.3	85.8
Max	1231.1	16078.8	4781.7	239.9	161.6	2006.3	8030.4	873.4	n.a.	3512.4	2816.8
	February-March										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	67	67	70	71	72	16	61	39	60	57	44
Mean	n.a.	1585.9	495.1	20.6	33.2	1245.5	977.3	309.1	912.8	452.4	540.6
SD	n.a.	2725.5	579.4	68.5	85.7	1224.6	1496.5	376	3395.1	501.2	771.1
Med	n.a.	605.9	242.6	0.7	5.6	521.0	553.8	160.7	262.9	312.1	250.9
Max	n.a.	16662.5	2377.5	391.9	659.4	4348.3	10712.9	1550.2	24031.9	2416.8	2903.7

	Copepods										
	January-February										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	63	70	63	71	72	71	61	40		60	44
	n.a	73.5	32.4	741.0	897.5	656.4	41.2	928.2	n.a.	1003.2	5484.3
	n.a	302.7	92.2	1061.3	1726.4	799.1	55.1	1590.8	n.a.	1582.4	14585.6
	n.a	0.0	0.0	346.0	338.2	399.7	21.5	333.0	n.a.	252.2	2174.9
	n.a	2312.6	465.3	7047.5	10598.0	4090.0	276.0	7524.8	n.a.	6909.7	96514.5
	February-March										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	67	67	70	71	72	16	61	39	60	57	44
	n.a.	n.a.	3453.3	3707.3	1483.7	1267.8	110.4	1558.4	8019.1	4501.5	17473.4
	n.a.	n.a.	8190.8	5750.3	2209.2	1755.6	170.3	2337.5	11824.4	8072.4	20036.9
	n.a.	n.a.	172.4	1630.9	970.2	659.8	50.9	621.6	3478.0	1518.0	7563.8
	n.a.	n.a.	37987.2	40998.5	16621.0	7289.2	901.1	10786.6	57498.5	39800.7	90224.5

	Euphausia superba Larvae										
	January-February										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	63	70	63	71	72	71	61	40		60	44
Mean	n.a.	n.a.	n.a.	172.1	3.4	19.3	0.4	175.1	n.a.	32.8	35.8
SD	n.a.	n.a.	n.a.	969.4	8.3	27.0	1.6	795.5	n.a.	86.2	64.6
Med	n.a.	n.a.	n.a.	0.0	0.0	6.4	0.0	4.3	n.a.	9.0	0.0
Max	n.a.	n.a.	n.a.	8076.1	42.7	96.5	11.4	5083.2	n.a.	654.0	356.3
	February-March										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	67	67	70	71	72	16	61	39	60	57	44
Mean	n.a.	n.a.	n.a.	4593.4	14.1	25.0	2.5	67.2	3423.2	71.9	50.1
SD	n.a.	n.a.	n.a.	20117.0	44.0	81.4	18.3	146.0	8974.1	176.9	140.8
Med	n.a.	n.a.	n.a.	268.6	3.3	0.0	0.0	12.3	248.7	5.1	0.0
Max	n.a.	n.a.	n.a.	167575.6	368.5	339.0	144.1	692.5	44478.2	1197.7	728.6

	Thysanoessa macrura Larvae										
	January-February										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	63	70	63	71	72	71	61	40		60	44
	n.a.	n.a.	n.a.	20.2	372.0	21.5	0.0	116.5	n.a.	269.3	773.3
	n.a.	n.a.	n.a.	75.2	858.1	38.4	0.0	348.8	n.a.	608.8	1379.1
	n.a.	n.a.	n.a.	0.0	32.1	1.5	0.0	2.8	n.a.	42.7	181.7
	n.a.	n.a.	n.a.	441.5	4961.8	159.9	0.0	1519.6	n.a.	3621.0	8984.2
	February-March										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	67	67	70	71	72	16	61	39	60	57	44
	n.a.	n.a.	31.7	344.3	511.5	10.8	0.5	185.9	1084.8	613.3	1444.9
	n.a.	n.a.	111.1	594.2	1432.5	24.9	2.0	535.7	4147.3	1009.5	2665.1
	n.a.	n.a.	0.0	79.9	36.1	1.0	0.0	10.0	26.8	265.3	364.0
	n.a.	n.a.	809.1	3735.5	10875.0	104.7	12.1	2990.8	31132.5	5461.9	12270.6

	Euphausia frigida										
	January-February										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	63	70	63	71	72	71	61	40		60	44
Mean	5.4	4.2	4.7	12.1	2.0	9.6	0.3	15.9	n.a.	23.4	28.0
SD	14.9	18.4	14.9	32.1	4.5	21.4	1.4	29.1	n.a.	55.9	56.1
Med	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	n.a.	0.0	0.4
Max		143.0	76.7	175.6	22.5	91.4	10.0	116.0	n.a.	315.6	256.1
	February-March										
Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
N	67	67	70	71	72	16	61	39	60	57	44
Mean	n.a.	1.0	28.9	19.7	9.5	44.8	9.0	23.0	43.1	37.7	78.4
SD	n.a.	4.7	62.0	36.7	12.7	54.2	26.0	38.7	73.0	82.0	192.3
Med	n.a.	0.0	5.5	2.9	1.2	21.0	0.0	7.6	6.8	0.0	5.1
Max	n.a.	32.6	439.7	216.1	48.8	176.2	178.4	159.1	307.2	319.2	1149.9

	Chaetognaths										
	January-February										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	63	70	63	71	72	71	61	40		60	44
	n.a.	3.1	0.2	84.7	11.9	20.1	3.3	63.9	n.a.	57.4	139.8
	n.a.	7.9	0.5	159.5	25.1	26.1	5.2	159.1	n.a.	110.9	221.1
	n.a.	0.0	0.0	30.0	4.2	10.3	0.9	14.7	n.a.	11.3	76.6
	n.a.	41.3	2.2	781.8	184.9	120.4	24.7	960.2	n.a.	660.7	1283.4
	February-March										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	67	67	70	71	72	16	61	39	60	57	44
	n.a.	0.7	21.8	330.2	58.4	18.4	8.9	147.4	792.3	93.5	1073.1
	n.a.	4.2	87.7	404.6	72.3	23.9	23.3	261.4	1543.7	173.4	1210.4
	n.a.	0.0	0.0	161.0	31.8	5.5	1.0	48.7	229.4	10.5	435.6
	n.a.	34.9	578.9	1769.9	383.8	77.9	124.7	1146.6	8221.0	836.9	5052.6

Table 4.8. Maturity stage composition of krill collected in the Elephant Island area during 2002 compared to 1992-2001. Advanced maturity stages are proportions of mature females that are (A) 3c-3e in January-February and (B) 3d-3e in February-March. Data are not available for January-February, 2000.

A. SURVEY A	ELEPHANT ISLAND AREA KRILL JANUARY-FEBRUARY										
Stage	1992 %	1993 %	1994 %	1995 %	1996 %	1997 %	1998 %	1999 %	2000 %	2001 %	2002 %
Juveniles	37.1	7.2	4.0	4.6	55.0	15.2	18.4	0.4	n.a.	9.7	46.3
Immature	19.1	30.7	18.8	4.0	18.3	30.6	31.7	11.7	n.a.	6.2	9.0
Mature	43.9	62.2	77.2	91.4	26.7	54.2	49.9	87.9	n.a.	84.1	44.7
Females:											
F2	0.8	7.8	2.3	0.1	1.1	6.3	9.1	1.6	n.a.	0.2	0.4
F3a	0.6	11.7	18.0	0.2	0.0	3.5	21.4	1.7	n.a.	0.9	0.5
F3b	12.3	14.3	19.3	1.2	0.2	0.6	9.0	1.8	n.a.	14.6	2.3
F3c	9.2	5.1	20.1	15.3	1.9	6.9	1.0	14.7	n.a.	13.2	13.7
F3d	0.4	1.2	2.3	17.7	0.7	6.1	0.3	23.9	n.a.	7.4	10.0
F3e	0.0	0.0	0.0	3.7	11.6	7.4	0.7	9.2	n.a.	1.3	6.2
Advanced Stages	42.7	19.5	37.5	96.3	98.3	83.2	6.2	93.2	n.a.	58.5	91.6
Males:											
M2a	8.7	6.8	0.3	0.9	14.6	14.6	8.5	2.2	n.a.	2.1	3
M2b	7.3	11.9	9.4	1.5	2.1	8.2	8.4	3.9	n.a.	2.1	4
M2c	2.3	4.2	6.8	1.5	0.5	1.5	5.7	4.1	n.a.	1.7	1.5
M3a	2.8	3.7	4.3	4.4	1.4	1.5	3.1	1.7	n.a.	2.1	1.7
M3b	18.7	26.2	13.2	48.9	10.9	28.1	14.4	34.9	n.a.	44.6	10.4
Male:Female ratio	1.7	1.3	0.5	1.5	1.9	1.8	1.0	0.9	n.a.	1.4	0.6
No. measured	2472	4283	2078	2294	4296	3209	3600	751	n.a.	2063	1437

B. SURVEY D	FEBRUARY-MARCH										
Stage	1992 %	1993 %	1994 %	1995 %	1996 %	1997 %	1998 %	1999 %	2000 %	2001 %	2002 %
Juveniles	33.6	3.5	3.7	1.1	20.8	8.0	3.6	0.0	0.1	13.4	38.9
Immature	27.1	51.4	6.2	2.5	9.9	19.7	25.4	1.3	2.3	14.7	17.3
Mature	39.2	45.1	90.1	96.4	69.3	72.3	71.0	98.7	97.5	71.9	43.8
Females:											
F2	0.8	21.8	0.7	0.3	0.6	1.1	6.9	0.0	0.2	0.7	3.3
F3a	10.3	12.4	3.5	0.0	0.0	0.1	10.9	0.4	1.0	2.4	0.9
F3b	10.2	6.2	7.8	0.0	0.0	0.0	11.8	0.0	0.7	0.2	0.2
F3c	4.3	3.7	4.3	2.0	5.0	1.8	3.0	11.1	6.5	1.5	2.2
F3d	1.2	1.1	4.6	21.8	10.9	29.1	1.3	47.3	21.9	3.8	14.7
F3e	<0.01	1.2	0.9	20.4	4.9	7.3	0.1	4.8	22.0	42.6	3.6
Advanced Stages	4.6	9.3	26.1	95.5	76.0	95.0	5.2	81.8	84.2	91.8	85.2
Males:											
M2a	4.3	6.9	0.2	0.7	6.5	8.6	1.9	0.0	0.1	4.1	8.8
M2b	19.8	19.1	1.2	0.4	1.2	8.8	6.6	0.7	0.7	2.7	3.6
M2c	2.2	3.6	4.2	1.1	1.6	1.2	10.0	0.6	1.3	7.3	1.6
M3a	2.5	2.1	24.1	4.4	5.3	3.7	17.5	2.6	7.4	2.2	0.3
M3b	10.7	18.4	44.7	47.8	43.2	30.3	26.2	32.4	38.0	19.2	22.1
Male:Female ratio	1.5	1.1	3.4	1.2	2.7	1.3	1.9	0.6	0.9	0.7	1.5
No. measured	3646	3669	1155	1271	2984	560	3153	1176	1371	1739	558

Table 4.9. Salp and krill carbon biomass (mg C per m^2) in the Elephant Island Area during 1995-2002 surveys. N is number of samples. Salp:Krill ratio is based on median values.

	January-February															
	1995		1996		1997		1998		1999		2000		2001		2002	
Biomass	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill
Mean	7.8	242.3	20.2	337.3	334.5	229.0	430.8	173.1	151.8	48.6	n.a.	n.a.	334.5	248.5	287.4	218.6
SD	16.1	201.1	30.9	756.1	1115.6	522.1	565.3	290.6	166.1	66.1	n.a.	n.a.	272.8	425.3	418.3	552.0
Median	1.3	43.5	10.0	72.2	108.9	45.1	187.0	46.7	93.2	14.5	n.a.	n.a.	251.7	81.0	127.0	37.6
Maximum	75.3	1545.2	134.2	4721.0	9434.6	3115.5	2699.0	1488.4	882.7	304.4	n.a.	n.a.	1395.1	2561.2	1855.4	3509.2
N	57	71	72	72	71	71	61	60	40	40	n.a.	n.a.	60	60	44	44
Salp:Krill Ratio	0.03		0.1		2.4		4.0		6.4		n.a.		3.1		3.4	

	February-March															
	1995		1996		1997		1998		1999		2000		2001		2002	
Biomass	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill	Salps	Krill
Mean	13.1	59.2	50.7	1702.3	1139.7	313.1	694.6	1555.8	321.9	451.0	741.2	204.4	333.9	890.3	738.4	62.3
SD	47.3	149.1	146.5	12441.6	1269.8	655.2	1121.2	8218.7	335.1	2082.6	2314.9	507.6	352.4	4116.8	2129.0	179.5
Median	0.7	13.1	4.6	40.7	504.8	50.0	379.4	31.6	193.5	6.9	239.0	42.8	216.3	45.9	327.1	2.7
Maximum	325.2	1107.1	954.0	106458.5	4645.4	2638.7	8543.0	62155.8	1698.1	13133.1	16400.1	3634.6	1702.8	30967.9	14362.1	1062.6
N	71	71	72	72	16	16	61	60	39	39	60	60	57	57	44	44
Salp:Krill Ratio	0.1		0.1		10.1		12.0		28.0		5.6		4.7		121.1	

Table 4.10. Abundance of biomass dominant copepod species in the Elephant Island area during various cruises 1981-2002. 1981-1990 data provided by John Wormuth. Abundance is numbers per 1000 m^3. n.a. indicates that data are not available.

SURVEY PERIOD		*Calanoides acutus*	*Calanus propinquus*	*Metridia gerlachei*	*Rhincalanus gigas*	*Pleuromama robusta*	*Pareuchaeta antarctica*	*Haloptilus ocellatus*	Copepodites	Other Copepods	Total Copepods
Jan-Feb 88	Mean	429.7	93.6	1639.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2162.3
N=48	STD	676.8	104.3	3488.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3928.6
	Median	80.5	45.5	57.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	618.5
Jan 90	Mean	302.5	354.4	981.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1700.2
N=23	STD	405.8	365.8	1620.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2003.7
	Median	170.1	243.6	192.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	656.7
Jan 99	Mean	335.4	109.1	340.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	927.0
N=40	STD	1009.5	161.9	512.7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1590.8
	Median	28.9	52.0	66.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	332.9
Jan 01	Mean	241.0	50.4	1003.2	20.2	5.5	0.2	0.0	n.a.	197.5	1003.2
N=60	STD	392.0	85.9	1582.4	74.8	21.0	0.6	0.0	n.a.	527.3	1582.4
	Median	117.7	12.5	252.2	0.0	0.0	0.0	0.0	n.a.	41.8	252.2
Jan 02	Mean	2931.3	1862.2	350.8	141.6	1.4	122.7	0.0	30.2	44.2	5484.3
N=44	STD	8293.0	5659.2	467.6	381.0	6.3	185.6	0.0	154.1	89.0	14585.6
	Median	876.4	502.7	130.3	16.4	0.0	57.7	0.0	0.0	11.0	2174.9

SURVEY PERIOD		*Calanoides acutus*	*Calanus propinquus*	*Metridia gerlachei*	*Rhincalanus gigas*	*Pleuromama robusta*	*Pareuchaeta antarctica*	*Haloptilus ocellatus*	Copepodites	Other Copepods	Total Copepods
Mar 81	Mean	4786.9	5925.8	2402.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	13115.2
N=10	STD	5482.2	6451.6	3321.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12799.9
	Median	2197.7	2048.7	609.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	8466.8
Feb-Mar 84	Mean	25.5	121.7	1154.4	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1301.6
N=13	STD	29.6	134.4	2999.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3043.9
	Median	16.2	51.4	23.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	96.6
Feb 89	Mean	161.4	194.9	3189.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3545.6
N=25	STD	240.9	151.5	4017.2	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4071.5
	Median	88.0	162.0	1051.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1776.0
Feb 99	Mean	511.8	300.9	521.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1557.9
N=39	STD	1395.6	630.6	699.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2337.8
	Median	70.7	70.8	216.9	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	621.6
Feb 00	Mean	1846.3	741.8	3051.7	1089.0	100.0	107.3	1.5	n.a.	1171.4	8019.1
N=60	STD	3177.2	1546.5	4783.5	2456.5	34.7	249.1	7.8	n.a.	28232.0	11824.4
	Median	225.2	193.3	1249.7	79.9	0.0	11.0	0.0	n.a.	297.6	3478.0
Feb-Mar 01	Mean	2540.2	247.1	1450.0	32.4	3.7	74.7	0.4	116.1	37.0	4501.5
N=57	STD	6921.6	402.9	2966.0	129.1	13.6	137.9	2.7	343.8	188.4	8072.4
	Median	111.5	122.2	140.1	0.0	0.0	20.8	0.0	23.2	0.0	1518.0
Feb-Mar 02	Mean	9569.2	3827.4	2515.1	1226.4	30.0	169.3	14.8	5.2	116.0	17473.4
N=44	STD	12553.1	4288.9	3124.5	1952.7	97.2	269.2	66.0	22.5	337.2	20036.9
	Median	4585.6	2037.2	1183.6	246.2	0.0	52.5	0.0	0.0	0.0	7563.8

Table 4.11. Zooplankton and nekton taxa present in the large survey area samples during (A) January 2002 and (B) February-March 2002 compared to 1995-2001 surveys. F is the frequency of occurrence (%) in (N) tows. Mean is number per 1000 m^3. n.a. indicates taxon was not enumerated. (L) and (J) denote larval and juvenile stages. Dashes denote previously unrecorded taxa.

A. SURVEY A	JANUARY-FEBRUARY															
	2002 N=95		2001 N=101		2000 N=0		1999 N=75		1998 N=105		1997 N=105		1996 N=91		1995 N=90	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Copepods	100.0	7536.2	100.0	2247.1	n.a.	n.a.	100.0	711.6	94.2	56.5	100.0	582.6	100.0	794.4	98.9	652.7
Thysanoessa macrura	92.6	222.6	93.1	73.5	n.a.	n.a.	93.3	135.1	100.0	180.8	97.1	104.4	98.9	106.9	91.1	96.4
Thysanoessa macrura (L)	90.5	1428.1	85.1	458.0	n.a.	n.a.	69.3	72.5	1.9	0.0	44.8	17.0	90.1	308.5	36.7	15.9
Salpa thompsoni	88.4	267.7	100.0	520.7	n.a.	n.a.	100.0	163.3	100.0	808.2	97.1	181.4	64.8	20.4	66.7	16.0
Themisto gaudichaudii	86.3	32.5	66.3	4.0	n.a.	n.a.	32.0	0.3	31.7	0.3	92.4	3.6	92.3	4.9	76.7	4.9
Chaetognaths	81.1	170.9	84.2	174.2	n.a.	n.a.	49.3	47.8	42.3	8.9	74.3	22.9	68.1	12.5	98.9	79.7
Clio pyramidata sulcata	75.8	53.4	32.7	5.9	n.a.	n.a.	9.3	0.1	4.8	0.3	2.9	0.0	6.6	0.1	72.2	5.3
Euphausia superba	74.7	65.5	89.1	27.7	n.a.	n.a.	60.0	6.1	92.3	36.8	93.3	40.4	96.7	112.5	87.8	14.5
Spongiobranchaea australis	69.5	1.9	68.3	2.1	n.a.	n.a.	69.3	1.4	45.2	0.9	67.6	2.2	47.3	1.8	64.4	0.5
Vibilia antarctica	66.3	3.9	98.0	16.3	n.a.	n.a.	94.7	3.8	96.2	13.2	70.5	2.5	48.4	0.5	22.2	0.2
Hyperiella dilatata	53.7	1.3	24.8	0.4	n.a.	n.a.	52.0	0.5	39.4	0.4	56.2	2.2	41.8	0.6	54.4	0.3
Primno macropa	52.6	6.3	7.9	0.1	n.a.	n.a.	69.3	2.5	26.0	0.7	63.8	4.3	20.9	0.1	20.0	0.1
Tomopteris spp.	46.3	3.0	45.5	1.9	n.a.	n.a.	56.0	2.0	31.7	1.3	54.3	1.9	60.4	0.9	84.4	4.2
Cyllopus magellanicus	44.2	3.3	30.7	0.5	n.a.	n.a.	78.7	2.0	64.4	1.9	76.2	3.8	41.8	1.6	24.4	0.2
Euphausia frigida	42.1	20.5	45.5	28.8	n.a.	n.a.	32.0	9.0	5.8	0.2	41.9	14.8	30.8	1.9	50.0	9.8
Radiolaria	42.1	1030.2	19.8	46.1	n.a.	n.a.	40.0	8.9	27.9	0.7	41.0	1.8	12.1	0.1	0.0	0.0
Clione limacina	40.0	2.3	26.7	0.9	n.a.	n.a.	17.3	0.1	38.5	0.9	21.9	0.3	56.0	2.1	41.1	0.5
Cyllopus lucasii	34.7	1.4	87.1	22.4	n.a.	n.a.	6.7	0.0	20.2	0.5	49.5	0.4	11.0	0.1	22.2	0.5
Euphausia superba (L)	28.4	19.4	68.3	160.2	n.a.	n.a.	65.3	103.1	11.5	1.0	55.2	15.2	22.0	2.7	22.2	135.8
Ostracods	28.4	111.0	37.6	6.7	n.a.	n.a.	49.3	2.8	51.0	4.8	41.0	5.5	53.8	4.9	56.7	9.7
Lepidonotothen larseni (L)	18.9	3.8	10.9	0.7	n.a.	n.a.	20.0	0.2	23.1	0.5	27.6	1.8	22.0	0.2	40.0	1.1
Diphyes antarctica	15.8	0.4	23.8	0.5	n.a.	n.a.	34.7	0.5	37.5	1.1	9.5	0.2	17.6	0.1	58.9	1.0
Hydromedusae	15.8	0.4	14.9	0.4	n.a.	n.a.	37.3	0.2	0.0	0.0	20.0	0.1	4.4	0.0	6.7	0.1
Polychaetes	15.8	6.7	7.9	0.7	n.a.	n.a.	20.0	0.6	28.8	1.5	1.0	0.0	1.1	0.0	0.0	0.0
Dimophyes arctica	13.7	0.6	10.9	0.2	n.a.	n.a.	6.7	0.1	2.9	0.1	19.0	0.3	15.4	0.1	25.6	0.8
Limacina helicina	12.6	0.8	51.5	4.9	n.a.	n.a.	61.3	2.4	73.1	8.1	47.6	2.9	74.7	33.7	43.3	1.9
Ihlea racovitzai	12.6	1.1	12.9	1.1	n.a.	n.a.	25.3	3.3	5.8	41.5	n.a	n.a	n.a	n.a	n.a	n.a
Euphausia crystallorophorias	12.6	16.5	1.0	0.0	n.a.	n.a.	9.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0
Hyperiella spp.	11.6	0.1	5.9	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausia spp. (L)	11.6	93.5	0.0	0.0	n.a.	n.a.	10.7	11.1	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Decapods (unid.)	9.5	14.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Larval Fish	8.4	3.3	18.8	0.6	n.a.	n.a.	9.3	0.1	8.7	0.1	0.0	0.0	1.1	0.0	0.0	0.0
Lepidonotothen kempi (L)	8.4	0.3	7.9	0.4	n.a.	n.a.	6.7	0.0	13.5	0.3	32.4	0.6	30.8	0.3	20.0	0.1
Euphausia triacantha	7.4	0.8	13.9	1.6	n.a.	n.a.	17.3	0.4	7.7	0.3	18.1	1.4	15.4	0.5	33.3	1.5
Lepidonotothen nudifrons (L)	5.3	0.1	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	8.9	0.1
Hyperiids	4.2	0.5	12.9	0.7	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notolepis coatsi (L)	4.2	0.0	1.0	0.0	n.a.	n.a.	5.3	0.0	3.8	0.0	6.7	0.0	8.8	0.0	27.8	0.1
Trematomus newnesi (L)	4.2	0.1	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Prionodraco evansii (J)	4.2	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Electrona spp. (L)	3.2	0.0	10.9	0.4	n.a.	n.a.	24.0	0.2	10.6	0.2	37.1	1.4	27.5	0.7	61.1	2.5
Electrona antarctica	3.2	0.0	5.9	0.0	n.a.	n.a.	1.3	0.0	3.8	0.1	9.5	0.0	13.2	0.0	13.3	0.1
Sipunculids	3.2	0.0	3.0	0.0	n.a.	n.a.	10.7	0.0	11.5	0.1	10.5	0.1	7.7	0.0	24.4	0.1
Cyllopus spp.	3.2	0.0	2.0	0.0	n.a.	n.a.	28.0	0.4	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Mysids	3.2	0.1	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperiella macronyx	3.2	0.0	0.0	0.0	n.a.	n.a.	2.7	0.0	2.9	0.1	8.6	0.1	5.5	0.0	23.3	0.1
Decapods (L)	3.2	1.7	0.0	0.0	n.a.	n.a.	1.3	0.0	2.9	0.0	0.0	0.0	2.2	0.2	0.0	0.0
Bathylagus sp. (L)	3.2	0.3	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	1.0	0.0	2.2	0.0	8.9	0.0
Isopods	3.2	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Beroe cucumis	2.1	0.0	20.8	0.3	n.a.	n.a.	4.0	0.0	3.8	0.0	15.2	0.1	7.7	0.0	12.2	0.0
Vanadis antarctica	2.1	0.0	5.0	0.1	n.a.	n.a.	5.3	0.1	4.8	0.1	1.0	0.0	4.4	0.0	15.6	0.1
Siphonophora	2.1	0.0	3.0	0.3	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona carlsbergi	2.1	0.0	2.0	0.0	n.a.	n.a.	2.7	0.0	1.0	0.0	10.5	0.1	n.a.	n.a.	n.a.	n.a.
Schyphomedusae	2.1	0.0	2.0	0.0	n.a.	n.a.	1.3	0.0	1.9	0.0	1.0	0.0	13.2	0.1	0.0	0.0
Cumacea	2.1	2.7	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	3.8	0.4	1.1	0.0	0.0	0.0
Acanthophyra pelagica	2.1	1.5	0.0	0.0	n.a.	n.a.	17.3	0.2	3.8	0.0	9.5	0.1	0.0	0.0	22.2	0.1
Chionodraco rastrospinosus (L)	2.1	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	1.9	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Modeeria rotunda?	2.1	0.2	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Pleurobrachia pileus	2.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Notothenia spp. (L)	2.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Clio pyramidata antarctica?	2.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Gastropods	2.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Chromatonema rubra?	2.1	0.1	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Zanclonia weldoni?	2.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Unid. Eggs	2.1	10.1	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Ctenophores	1.1	0.0	5.0	0.1	n.a.	n.a.	6.7	0.0	3.8	0.1	16.2	0.1	0.0	0.0	6.7	0.0
Hyperoche medusarum	1.1	0.0	5.0	0.1	n.a.	n.a.	5.3	0.0	1.0	0.0	1.0	0.0	3.3	0.0	18.9	0.0

Table 4.11. (Contd.)

A. SURVEY A	JANUARY - FEBRUARY															
	2002		2001		2000		1999		1998		1997		1996		1995	
	N=95		N=101		N=0		N=75		N=105		N=105		N=91		N=90	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Calycopsis borchgrevinki	1.1	0.0	4.0	0.2	n.a.	n.a.	2.7	0.0	1.0	0.0	2.9	0.0	2.2	0.0	1.1	0.0
Pleuragramma antarcticum (J)	1.1	0.0	4.0	0.1	n.a.	n.a.	1.3	0.1	4.8	0.0	2.9	0.0	1.1	0.0	2.2	0.0
Pelagobia longicirrata	1.1	0.0	3.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	1.1	0.0	0.0	0.0
Gymnoscopelus braueri	1.1	0.0	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona subaspera	1.1	0.0	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.
Hyperia antarctica	1.1	0.0	1.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0
Bolinopsis infundibulus	1.1	0.0	0.0	0.0	n.a.	n.a.	5.3	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gammarids	1.1	0.0	0.0	0.0	n.a.	n.a.	2.7	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	1.1	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Pegantha margaton	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Orchomene plebs	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	2.9	0.0	1.1	0.0	4.4	0.0
Gymnoscopelus nicholsi	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	1.1	0.0	1.1	0.0
Eusirus antarcticus	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Hyperiella antarctica	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2	0.0
Artedidraco mirus (L)	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Krefftichthys anderssoni (L)	1.1	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0
Trematomus scotti (L)	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Pasiaphaea sp. (L)	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Parachaenechthys charcoti (L)	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Schizobrachium polycotylum?	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Trematomus lepidorhinus (L)	1.1	0.1	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Clione antarctica	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Staurophora mertensi ?	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Crustacean larvae	1.1	0.8	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Spongiobranchaea sp.	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Lepidonotothen larseni (J)	1.1	0.0	—	—	n.a.	n.a.	—	—	—	—	—	—	—	—	—	—
Beroe forskalii	0.0	0.0	17.8	0.2	n.a.	n.a.	2.7	0.0	1.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Jellies	0.0	0.0	16.8	0.6	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Botrynema brucei	0.0	0.0	5.0	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Notolepis spp. (L)	0.0	0.0	2.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhynchonereella bongraini	0.0	0.0	1.0	0.0	n.a.	n.a.	33.3	0.8	9.6	0.2	4.8	0.1	2.2	0.0	3.3	0.1
Orchomene rossi	0.0	0.0	1.0	0.0	n.a.	n.a.	4.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	5.6	0.0
Eusirus perdentatus	0.0	0.0	1.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	1.1	0.0	22.2	0.1
Cephalopods	0.0	0.0	1.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Maupasia coeca	0.0	0.0	1.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	1.9	0.0	1.1	0.0	0.0	0.0
Epimeriella macronyx	0.0	0.0	1.0	0.0	n.a.	n.a.	0.0	0.0	5.8	0.2	1.9	1.4	1.1	0.0	8.9	0.0
Scina spp.	0.0	0.0	1.0	0.1	n.a.	n.a.	0.0	0.0	0.0	0.0	4.8	0.1	0.0	0.0	0.0	0.0
Notolepis annulata (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	2.7	0.0	0.0	0.0	1.0	0.0	0.0	0.0	13.3	0.0
Vogtia serrata	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	3.8	0.1	0.0	0.0	0.0	0.0
Fish Eggs	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	1.0	0.0	2.9	0.1	1.1	0.0	4.4	0.0
Bylgides pelagica	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	2.9	0.1	0.0	0.0	5.6	0.0
Notothenia coriiceps (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Patagonitothen b. guntheri (J)	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Periphylla periphylla	0.0	0.0	0.0	0.0	n.a.	n.a.	1.3	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0
Thyphloscolex muelleri	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	4.4	0.0	0.0	0.0
Travisiopsis levinseni	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Travisiopsis coniceps	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Chaenodraco wilsoni (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaenocephalus aceratus (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chorismus antarcticus	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Cyphocaris richardi	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	4.4	0.0
Cryodraco antarctica (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Artededraco skottsbergi (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Arctapodema ampla	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Artededraco sp. B (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Bolinopsis sp.	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Atolla wyvillei	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	2.9	0.0	1.1	0.0	7.8	0.0
Euphysora gigantea	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Hyperia macrocephala	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.1	1.0	0.0	0.0	0.0	3.3	0.0
Harpagifer antarcticus (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Krefftichthys anderssoni	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Phalacrophorus pictus	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Oediceroides calmani	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Eusirus sp.	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eusirus microps	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0
Gosea brachyura	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0
Gymnoscopelus opisthopteris	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	3.8	0.0	2.2	0.0	7.8	0.0
Gymnodraco acuticeps (L)	0.0	0.0	0.0	0.0	n.a.	n.a.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
TOTAL		11143.1		3812.2		n.a.		1294.2		1172.7		1015.2		1408.9		1052.2
NO. TAXA	92		63		n.a		65		63		70		66		68	

Table 4.11. (Contd.)

B. SURVEY D	FEBRUARY-MARCH															
	2002 N=94		2001 N=97		2000 N=97		1999 N=67		1998 N=104		1997 N=16		1996 N=91		1995 N=89	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Copepods (Total)	100.0	15904.8	99.0	5915.7	99.0	7038.7	100.0	1454.5	97.1	119.0	100.0	1267.8	98.9	1387.0	100.0	3189.1
Chaetognaths	97.9	880.1	77.1	164.5	91.8	632.8	91.0	127.4	61.5	10.7	75.0	18.2	93.4	64.1	100.0	296.4
Themisto gaudichaudii	97.9	30.2	79.2	4.3	83.5	7.2	32.8	0.2	32.7	0.3	87.5	2.9	91.2	2.5	74.2	3.6
Thysanoessa macrura (L)	96.8	1111.5	91.7	718.3	82.5	883.9	74.6	137.4	13.5	2.6	50.0	10.8	87.9	414.4	79.8	276.9
Salpa thompsoni	80.9	621.6	100.0	392.1	96.9	726.2	100.0	248.1	98.1	689.1	100.0	1245.5	62.6	28.2	59.6	16.5
Thysanoessa macrura	79.8	112.8	86.5	639.0	92.8	41.5	98.5	93.1	100.0	177.4	100.0	181.3	91.2	143.3	93.3	161.3
Euphausia frigida	66.0	80.0	50.0	42.0	67.0	49.9	64.2	20.0	29.8	9.3	68.8	44.8	54.9	9.0	60.7	16.7
Euphausia superba	57.4	281.6	79.2	59.0	77.3	21.0	61.2	24.4	89.4	133.5	68.8	30.4	86.8	106.7	78.7	5.7
Primno macropa	57.4	28.2	28.1	1.5	44.3	3.2	65.7	2.6	49.0	1.9	18.8	0.5	63.7	3.5	31.5	0.4
Spongiobranchaea australis	47.9	1.3	70.8	4.1	68.0	2.7	65.7	1.0	38.5	0.8	43.8	2.8	68.1	1.4	60.7	0.4
Vibilia antarctica	46.8	22.2	99.0	10.9	95.9	20.2	98.5	3.6	96.2	8.0	81.3	8.1	48.4	1.0	23.6	0.2
Hyperiella dilatata	38.3	2.6	30.2	0.4	22.7	0.4	56.7	1.2	34.6	0.4	25.0	0.2	52.7	0.8	24.7	0.1
Radiolarians	36.2	7918.3	32.3	216.2	40.2	531.4	40.3	6.3	28.8	1.0	12.5	0.7	34.1	0.9	27.0	0.4
Cyllopus magellanicus	34.0	2.8	70.8	2.9	87.6	10.0	95.5	4.8	81.7	5.6	93.8	3.3	46.2	2.1	25.8	0.7
Cyllopus lucasii	30.9	3.0	96.9	26.6	4.1	0.0	29.9	0.2	57.7	1.6	93.8	2.4	34.1	0.2	23.6	0.5
Euphausia superba (L)	28.7	61.0	64.6	683.4	80.4	2129.6	80.6	49.8	12.5	1.6	37.5	25.0	62.6	13.9	93.3	3690.0
Ostracods	22.3	42.6	20.8	10.1	45.4	25.1	80.6	14.0	43.3	5.4	56.3	4.8	47.3	10.1	75.3	43.4
Euphausia triacantha	22.3	2.2	16.7	1.2	25.8	1.9	22.4	1.8	11.5	0.6	43.8	0.9	22.0	0.8	28.1	1.6
Electrona spp. (L)	20.2	2.2	12.5	0.8	43.3	4.0	20.9	0.3	10.6	0.2	12.5	0.1	38.5	0.9	62.9	5.2
Euphausia frigida (L)	19.1	53.4	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Tomopteris spp.	18.1	1.1	19.8	0.4	23.7	2.3	55.2	2.8	8.7	0.0	31.3	0.5	38.5	0.9	57.3	1.3
Lepidonotothen kempi (L)	18.1	0.3	19.8	0.2	29.9	0.3	16.4	0.1	22.1	0.2	6.3	0.2	39.6	0.4	48.3	0.4
Cyllopus spp.	13.8	0.9	0.0	0.0	25.8	2.9	0.0	0.0	24.0	0.7	24.0	0.7	0.0	0.0	0.0	0.0
Notolepis coatsi (L)	12.8	0.2	2.1	0.0	6.2	0.0	0.0	0.0	4.8	0.0	0.0	0.0	18.7	0.1	36.0	0.2
Hyperiella spp.	12.8	0.2	0.0	0.0	9.3	0.3	9.0	0.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Electrona antarctica	12.8	0.1	5.2	0.0	15.5	0.1	6.0	0.0	8.7	0.0	31.3	0.2	20.9	0.2	15.7	0.1
Euphausia crystallorophorias	11.7	65.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Lepidonotothen larseni (L)	11.7	1.8	14.6	0.2	3.1	0.0	11.9	0.0	13.5	0.1	0.0	0.0	13.2	0.3	10.1	0.0
Dimophyes arctica	8.5	0.1	15.6	0.2	15.5	0.6	0.0	0.0	16.3	0.4	12.5	0.1	13.2	0.1	13.5	0.3
Diphyes antarctica	8.5	0.2	20.8	0.2	21.6	0.4	31.3	0.3	29.8	0.4	6.3	0.3	7.7	0.1	23.6	0.4
E. crystallorophorias (L)	6.4	14.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gymnoscopelus braueri	6.4	0.1	7.3	0.0	8.2	0.1	7.5	0.1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Zanclonia weldoni?	6.4	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Limacina helicina	5.3	0.6	33.3	1.8	45.4	205.4	26.9	1.9	37.5	0.8	0.0	0.0	24.2	1.9	4.5	0.0
Ihlea racovitzai	5.3	0.3	3.1	0.3	13.4	0.6	26.9	5.1	61.5	51.5	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Pleuragramma antarcticum (L)	5.3	0.2	5.2	0.1	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	1.1	0.0	2.2	0.0
Clio pyramidata sulcata	5.3	0.2	10.4	0.4	5.2	0.0	13.4	0.1	0.0	0.0	0.0	0.0	3.3	0.0	12.4	0.0
Hydromedusae	5.3	0.0	4.2	0.0	23.7	0.5	40.3	0.3	12.5	0.2	12.5	0.2	3.3	0.1	5.6	0.0
Gammarids	4.3	2.3	4.2	0.4	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sipunculids	4.3	1.5	12.5	0.3	12.4	0.1	11.9	0.0	4.8	0.1	6.3	0.0	8.8	0.1	9.0	0.0
Clione limacina	4.3	0.1	16.7	0.9	5.2	0.0	3.0	0.0	10.6	0.1	12.5	0.0	15.4	0.2	0.0	0.0
Clio pyramidata antarctica?	4.3	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Clytia sp.?	4.3	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Calycopsis borchgrevinki	4.3	0.0	6.3	0.0	13.4	0.2	19.4	0.4	4.8	0.0	6.3	0.0	6.6	0.0	11.2	0.0
Trematomus scotti (L)	4.3	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Euphausia spp. (L)	3.2	4.4	1.0	0.4	11.3	4.3	13.4	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chromatonema rubra?	3.2	0.3	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pegantha margaton	3.2	0.1	27.1	0.3	13.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperoche medusarum	3.2	0.0	10.4	0.1	3.1	0.0	4.5	0.0	0.0	0.0	12.5	0.3	2.2	0.0	12.4	0.0
Mysids	2.1	0.1	1.0	0.1	1.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eusirus antarcticus	2.1	0.0	5.2	0.1	1.0	0.0	1.5	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyphocaris richardi	2.1	0.0	1.0	0.0	3.1	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.4	0.1
Lepidonotothen nudifrons (L)	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	3.4	0.0
Modeeria rotunda?	2.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Orchomene plebs	2.1	0.0	1.0	0.0	2.1	0.8	0.0	0.0	1.9	0.0	0.0	0.0	2.2	0.0	3.4	0.0
Harpagifer antarcticus (L)	2.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Gymnoscopelus nicholsi	2.1	0.0	3.1	0.0	1.0	0.0	1.5	0.0	1.0	0.0	12.5	0.1	3.3	0.0	1.1	0.0
Vanadis antarctica	2.1	0.0	1.0	0.0	4.1	0.1	1.5	0.0	3.8	0.1	0.0	0.0	1.1	0.0	6.7	0.0
Cephalopods	2.1	0.0	1.0	0.0	2.1	0.0	4.5	0.0	1.9	0.0	0.0	0.0	9.9	0.0	0.0	0.0
Bolinopsis spp.	2.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Cumaceans	1.1	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Scina spp.	1.1	0.0	0.0	0.0	1.0	0.0	1.5	0.0	0.0	0.0	6.3	0.5	2.2	0.0	1.1	0.0
Limacina spp.	1.1	0.2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Champsocephalus gunnari (L)	1.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Electrona carlsbergi	1.1	0.0	6.3	0.0	1.0	0.0	4.5	0.0	1.9	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.
Polychaetes	1.1	0.0	6.3	0.6	18.6	2.6	7.5	0.3	13.5	0.3	0.0	0.0	3.3	0.1	2.2	0.0
Larval Fish	1.1	0.0	1.0	0.0	6.2	0.6	14.9	0.7	1.9	0.1	0.0	0.0	1.1	0.0	0.0	0.0
Pelagobia longicirrata	1.1	0.0	0.0	0.0	5.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notolepis spp. (L)	1.1	0.0	1.0	0.2	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Beroe cucumis	1.1	0.0	7.3	0.1	2.1	0.0	9.0	0.0	4.8	0.0	0.0	0.0	11.0	0.1	4.5	0.0
Acanthophyra pelagica	1.1	0.0	0.0	0.0	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0
Bathydraco antarcticus (L)	1.1	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchomene rossi	1.1	0.0	0.0	0.0	0.0	0.0	1.5	0.0	1.0	0.0	0.0	0.0	5.5	0.5	6.7	0.0
Periphylla periphylla	1.1	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0
Hyperiella macronyx	1.1	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	6.3	0.0	6.6	0.1	13.5	0.0
Atolla wyvillei	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Mitrocomella brownei?	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Pyrasoma atlanticum	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Parachaenechthys charcoti (L)	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Arctapodema ampla	1.1	0.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Table 4.11. (Contd.)

B. SURVEY D	FEBRUARY-MARCH															
	2002 N=94		2001 N=97		2000 N=97		1999 N=67		1998 N=104		1997 N=16		1996 N=91		1995 N=89	
TAXON	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean	F(%)	Mean
Euphausia triacantha (L)	1.1	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trematomus centronotus (L)	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Gerlache australis (L)	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Trematomus newnesi (L)	1.1	0.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Euphausiid eggs	0.0	0.0	19.8	9.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Beroe forskalii	0.0	0.0	10.4	0.0	13.4	0.1	9.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Hyperiids	0.0	0.0	5.2	0.3	8.2	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ctenophora	0.0	0.0	5.2	0.0	6.2	0.1	4.5	0.0	0.0	0.0	6.3	0.0	1.1	0.0	3.4	0.0
Pleurobrachia pileus	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Callianira antarctica	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fish Eggs	0.0	0.0	3.1	0.0	0.0	0.0	1.5	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Siphonophora	0.0	0.0	2.1	0.0	10.3	2.3	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Rhynchonereella bongraini	0.0	0.0	2.1	0.0	5.2	0.6	31.3	2.3	1.0	0.0	0.0	0.0	5.5	0.1	20.2	0.1
Bylgides pelagica	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0
Electrona subaspera	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	n.a.	n.a.	n.a.	n.a.
Eusirus perdentatus	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.2	0.0	6.7	0.1
Chionodraco rastrospinosus (L)	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Krefftichthys anderssoni (L)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Botrynema brucei	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Laodicea undulata	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Schyphomedusae	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	12.5	0.0	19.8	0.1	13.5	0.1
Gymnoscopelus bolini	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notothenia coriiceps (L)	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gastropods	0.0	0.0	0.0	0.0	4.1	17.6	6.0	0.5	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausia spp.	0.0	0.0	0.0	0.0	4.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bolinopsis infundibulus	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leusia spp.	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gobionotothen gibberifrons (L)	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Epimeriella macronyx	0.0	0.0	0.0	0.0	2.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	5.6	0.6
Protomyctophum bolini	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Solomondella spp.	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Orchomene spp.	0.0	0.0	0.0	0.0	1.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pasiaphaea sp. (L)	0.0	0.0	0.0	0.0	1.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chorismus antarcticus	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gymnoscopelus sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperia macrocephala	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	1.1	0.0	5.6	0.0
Pagothenia brachysoma	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chaenodraco wilsoni (J)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rhynchonereella sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Travisiopsis coniceps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	0.0
Eusirus microps	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0
Gymnoscopelus opisthopteris	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	10.1	0.0
Bathylagus sp. (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	1.1	0.0	14.6	0.0
Decapods (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0
Notolepis annulata (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	5.5	0.0	3.4	0.0
Pagetopsis macropterus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Hyperia spp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.1	0.0	0.0
Lepidonotothen larseni (J)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0
Artedidraco skottsbergi (L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL		27260.8		8910.2		12378.9		2207.6		1224.4		2854.0		2196.4		7713.3
TAXA	83		61		72		57		59		36		62		61	

Table 4.12. Percent contribution and abundance rank (R) of numerically dominant zooplankton and nekton taxa in the Elephant Island area during (A) January-February and (B) February-March surveys, 1994-2002. Includes the 10 most abundant taxa each year. Radiolarians excluded as a taxonomic category. No samples were collected January-February 2000. n.a. indicates that taxon was not enumerated during other surveys. Shaded column is a "salp year".

A. SURVEY A	JANUARY-FEBRUARY ELEPHANT ISLAND AREA																	
	1994		1995		1996		1997		1998		1999		2000		2001		2002	
TAXON	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R
Copepods	4.08	3	61.54	1	56.18	1	57.16	1	4.80	3	58.05	1	n.a.		46.76	1	75.69	1
Thysanoessa macrura (L)	n.a.		1.50	6	21.82	2	1.67	6	0.00		7.29	4	n.a.		12.55	3	10.67	2
Salpa thompsoni	80.83	1	1.51	5	1.45	6	17.79	2	68.76	1	12.35	2	n.a.		29.03	2	5.66	3
Thysanoessa macrura	7.87	2	9.09	3	7.56	4	10.24	3	15.38	2	2.92	6	n.a.		2.15	5	2.77	4
Chaetognaths	0.04		7.84	4	0.90	7	2.28	5	0.92	7	4.00	5	n.a.		2.68	4	1.93	5
Euphausia superba	2.68	4	1.37	7	7.95	3	3.96	4	3.13	6	0.33	8	n.a.		0.88	10	0.54	6
Euphausia superba (L)	n.a.		12.80	2	0.19	10	1.49	7	0.09		10.95	3	n.a.		1.53	6	0.49	7
Clio pyramidata	0.53	8	0.50	10	0.01		0.00		0.02		0.01		n.a.		0.08		0.46	8
Euphausia frigida	0.38	9	0.92	8	0.14		1.45	8	0.02		1.00	7	n.a.		1.09	7	0.39	9
Themisto gaudichaudii	1.05	6	0.46		0.34	9	0.35		0.03		0.02		n.a.		0.17		0.32	10
Primno macropa	0.05		0.01		0.01		0.42	10	0.06		0.13		n.a.		0.10		0.12	
Ostracods	n.a.		0.91	9	0.35	8	0.54	9	0.41	9	0.13		n.a.		0.25		0.09	
Vibilia antarctica	1.17	5	0.02		0.04		0.24		1.12	6	0.32	9	n.a.		0.98	8	0.06	
Tomopteris spp.	0.25	10	0.40		0.06		0.19		0.11		0.15	10	n.a.		0.11		0.03	
Limacina helicina	0.03		0.18		2.38	5	0.28		0.69	8	0.07		n.a.		0.14		0.03	
Euphausia triacantha	0.12		0.14		0.04		0.14		0.02		0.03		n.a.		0.10		0.02	
Ihlea racovitzai	n.a.		n.a.		n.a.		n.a.		3.53	4	0.15		n.a.		0.02		0.02	
Cyllopus lucasii	0.62	7	0.02		0.11		0.37		0.16	10	0.15		n.a.		0.98	9	0.02	
Spongiobranchaea australis	0.01		0.05		0.13		0.22		0.07		0.09		n.a.		0.09		0.02	
TOTAL	99.69		99.26		99.64		98.79		99.32		98.15		n.a.		99.68		99.341	

B. SURVEY D	FEBRUARY-MARCH ELEPHANT ISLAND AREA																	
	1994		1995		1996		1997		1998		1999		2000		2001		2002	
TAXON	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R	%	R
Copepods	82.15	1	40.49	2	62.07	1	44.46	1	7.38	4	62.77	1	54.20	1	64.68	1	83.13	1
Thysanoessa macrura (L)	n.a.		3.76	3	21.40	2	0.38	8	0.03		7.49	3	7.33	3	8.81	3	6.87	2
Chaetognaths	0.47	6	3.61	4	2.43	5	0.65	7	0.60	8	5.94	4	5.35	5	1.34	5	5.11	3
Salpa thompsoni	11.78	2	0.22	7	1.39	6	43.62	2	65.31	1	12.46	2	6.17	4	6.50	4	2.71	4
Euphausia frigida (L)	n.a.		n.a.		n.a.		n.a.		n.a.		n.a.		n.a.		n.a.		0.40	5
Euphausia frigida	0.69	5	0.21	8	0.40	8	1.57	4	0.60	7	1.00	8	0.29	7	0.54	8	0.37	6
Thysanoessa macrura	1.83	3	0.87	5	4.86	4	6.36	3	9.40	3	3.84	5	0.24	8	14.96	2	0.27	7
Euphausia superba (L)	n.a.		50.16	1	0.59	7	0.88	6	0.16		2.71	6	23.14	2	1.03	7	0.20	8
Primno macropa	0.00		0.00		0.15	10	0.02		0.11		0.08		0.02		0.03		0.21	9
Vibilia antarctica	0.16	9	0.00		0.05		0.28	9	0.71	6	0.15		0.18	10	0.21	10	0.16	10
Themisto gaudichaudii	0.27	8	0.01		0.09		0.10		0.01		0.01		0.02		0.07		0.12	
Ostracods	n.a.		0.43	6	0.38	9	0.17	10	0.35	10	0.65	9	0.20	9	0.03		0.06	
Euphausia superba	0.41	7	0.06	10	5.57	3	1.07	5	10.87	2	1.43	7	0.10		1.15	6	0.05	
Cyllopus magellanicus	0.12		0.01		0.10		0.12		0.55	9	0.17		0.07		0.02		0.02	
Electrona spp. (L)	0.75	4	0.07	9	0.04		0.01		0.01		0.01		0.03		0.02		0.02	
Cyllopus lucasii	0.14	10	0.01		0.01		0.08		0.14		0.01		0.00		0.43	9	0.01	
Euphausia triacantha	0.03		0.02		0.03		0.03		0.04		0.06		0.01		0.02		0.01	
Euphausia spp. (L)	n.a.		0.00		0.00		0.00		0.00		0.10		0.04		0.01		0.00	
Limacina helicina	0.00		0.00		0.01		0.00		0.03		0.00		2.21	6	0.00		0.00	
Ihlea racovitzai	n.a.		n.a.		n.a.		n.a.		2.77	5	0.34	10	0.00		0.00		0.00	
TOTAL	98.795		99.94		99.56		99.79		96.28		98.77		99.61		99.856		99.72	

Table 4.13. Percent Similarity Index (PSI) values from comparisons of overall zooplankton composition in the Elephant Island area during Surveys (A) A and (B) D, 1994-2002. Shading denotes the 1998 "salp year".

A.	JANUARY-FEBRUARY PSI VALUES							
Year	1995	1996	1997	1998	1999	2000	2001	2002
1994	16.7	16.6	34.2	85.0	20.9	n.a.	38.7	14.5
1995	xxxxx	70.3	76.8	18.7	80.7	n.a.	58.9	71.7
1996		xxxxx	73.4	19.3	70.0	n.a.	65.9	73.4
1997			xxxxx	38.4	80.2	n.a.	75.7	71.3
1998				xxxxx	22.6	n.a.	39.8	15.2
1999					xxxxx	n.a.	75.1	77.4
2000						xxxxx	n.a.	n.a.
2001							xxxxx	69.2

B.	FEBRUARY-MARCH PSI VALUES							
Year	1995	1996	1997	1998	1999	2000	2001	2002
1994	42.4	66.9	60.1	22.9	78.4	61.8	74.9	86.4
1995	xxxxx	49.1	44.0	10.0	52.4	72.0	48.1	48.9
1996		xxxxx	54.3	21.1	80.3	67.0	80.9	74.1
1997			xxxxx	60.5	65.2	53.6	61.3	49.5
1998				xxxxx	27.7	15.5	26.2	12.0
1999					xxxxx	76.9	85.0	78.7
2000						xxxxx	71.0	70.0
2001							xxxxx	76.8

Table 4.14. Taxonomic composition of two zooplankton clusters during February-March 2002 Survey D. R and % are rank and proportion of total mean abundance represented by each taxon.

	CLUSTER 2 (OCEANIC) N=29					CLUSTER 1 (SHELF AND COASTAL) N=65				
TAXON	R	%	MEAN	STD	MEDIAN	R	%	MEAN	STD	MEDIAN
Radiolarians	1	39.0	25664.6	43458.1	7344.8		0.0	0.8	4.1	0.0
Calanoides acutus	2	24.3	15958.3	16137.8	11410.1	1	36.5	3545.6	5239.0	1730.3
Calanus propinquus	3	15.1	9965.0	13352.4	5597.4	3	18.6	1805.6	3269.1	946.2
Metridia gerlachei	4	6.3	4158.8	4095.8	2643.3	2	19.5	1887.2	2729.1	460.4
Rhincalanus gigas	5	4.8	3170.3	4469.2	1678.2	6	4.2	405.8	802.2	81.9
Thysanoessa macrura (L)	6	4.0	2653.3	3379.8	916.3	5	4.4	423.7	749.3	192.9
Chaetognaths	7	2.8	1867.3	1479.1	1836.2	4	4.5	439.6	599.0	224.8
Salpa thompsoni	8	2.1	1351.3	2106.1	352.6	8	3.1	296.1	633.8	23.8
Other copepods	9	0.5	299.6	541.0	0.0	15	0.3	26.0	89.3	0.0
Pareuchaeta antarctica	10	0.4	263.9	328.4	137.4	10	1.1	104.8	151.7	38.7
Euphausia frigida	11	0.1	87.7	210.4	18.6	11	0.8	76.5	335.6	2.2
Euphausia superba (L)	12	0.1	71.4	168.9	0.0	12	0.6	56.4	239.7	0.0
Ostracods	13	0.1	60.5	128.4	0.0	13	0.4	34.6	107.0	0.0
Vibilia antarctica	14	0.1	58.7	156.9	1.9		0.1	5.9	22.6	0.0
Primno macropa	15	0.1	58.1	158.1	1.8		0.2	14.8	31.7	0.4
Thysanoessa macrura		0.1	57.3	141.6	3.7	9	1.4	137.6	283.9	31.5
Themisto gaudichaudii		0.0	30.7	29.7	16.6	14	0.3	30.0	45.3	17.1
Euphausia superba		0.0	7.1	20.9	0.0	7	4.2	404.0	1700.6	1.3
Cyllopus lucasii		0.0	6.6	18.4	0.0		0.0	1.4	6.0	0.0
Euphausia triacantha		0.0	5.4	8.5	0.0		0.0	0.7	2.7	0.0
Hyperiella dilatata		0.0	4.3	7.7	0.4		0.0	1.8	8.1	0.0
Cyllopus magellanicus		0.0	4.1	12.8	0.0		0.0	2.2	8.7	0.0
Spongiobranchaea australis		0.0	2.4	3.5	1.2		0.0	0.8	2.9	0.0
TOTAL			65806.7					9701.9		

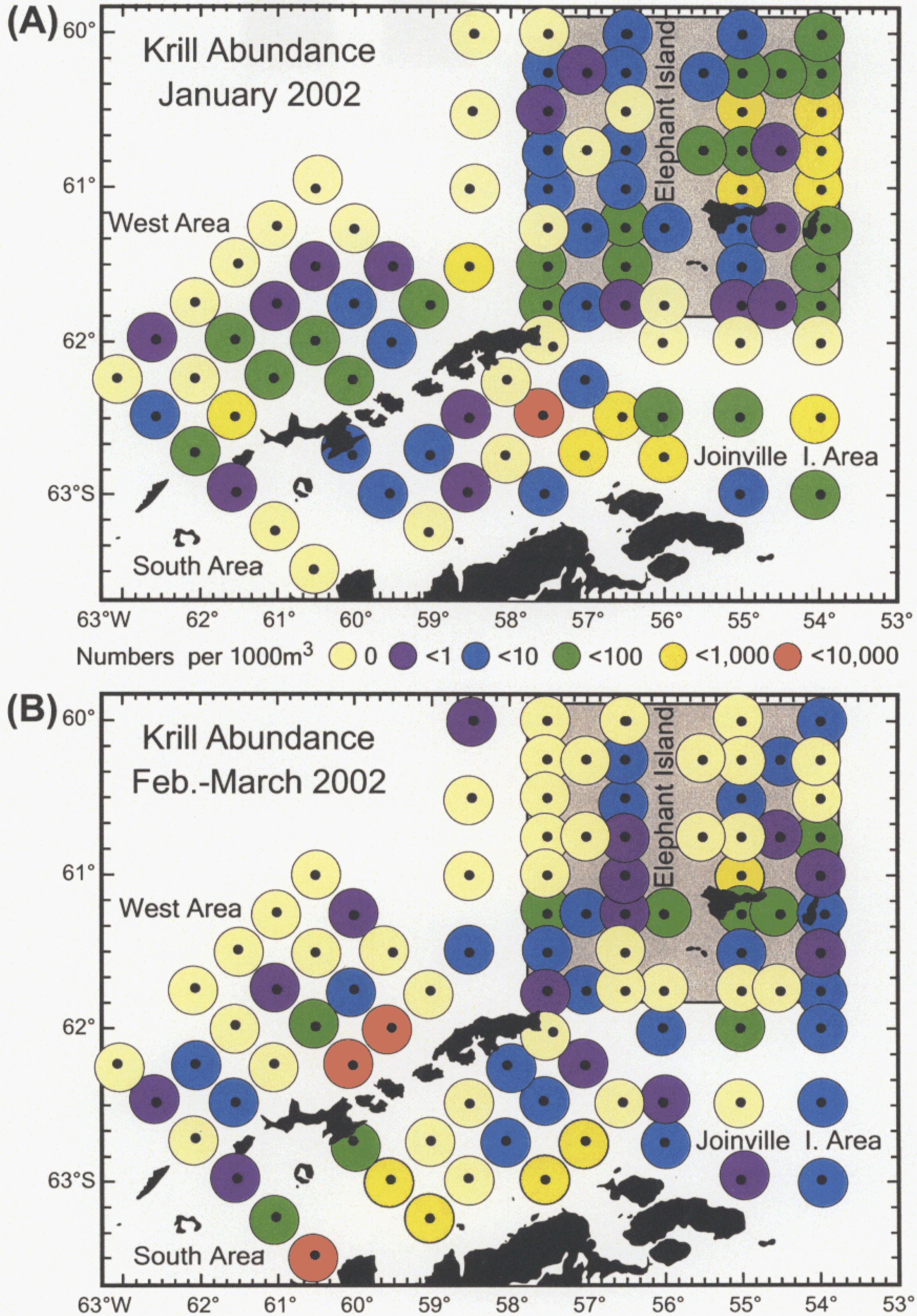
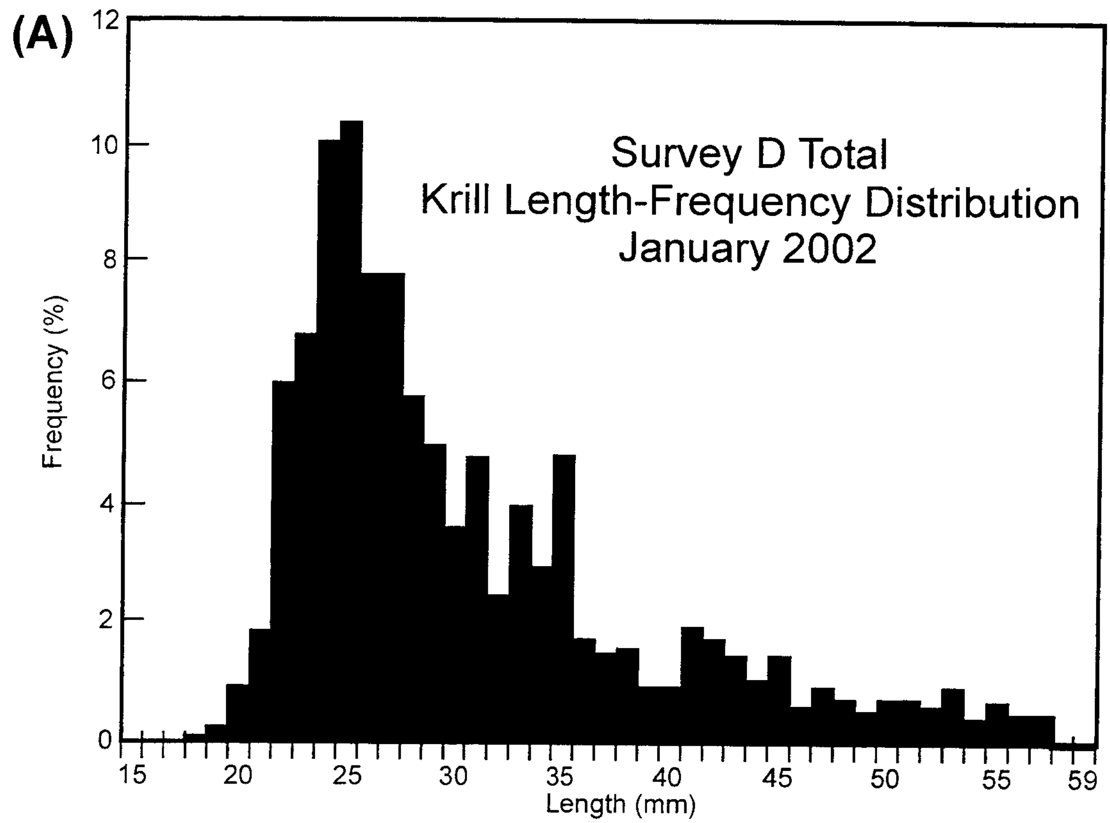


Figure 4.1. Krill abundance in IKMT tows collected during (A) January Survey A and (B) February-March Survey D. The outlined stations are included in the Elephant Island Area and used for between-year comparisons. West, South and Joinville Island Area stations are indicated..



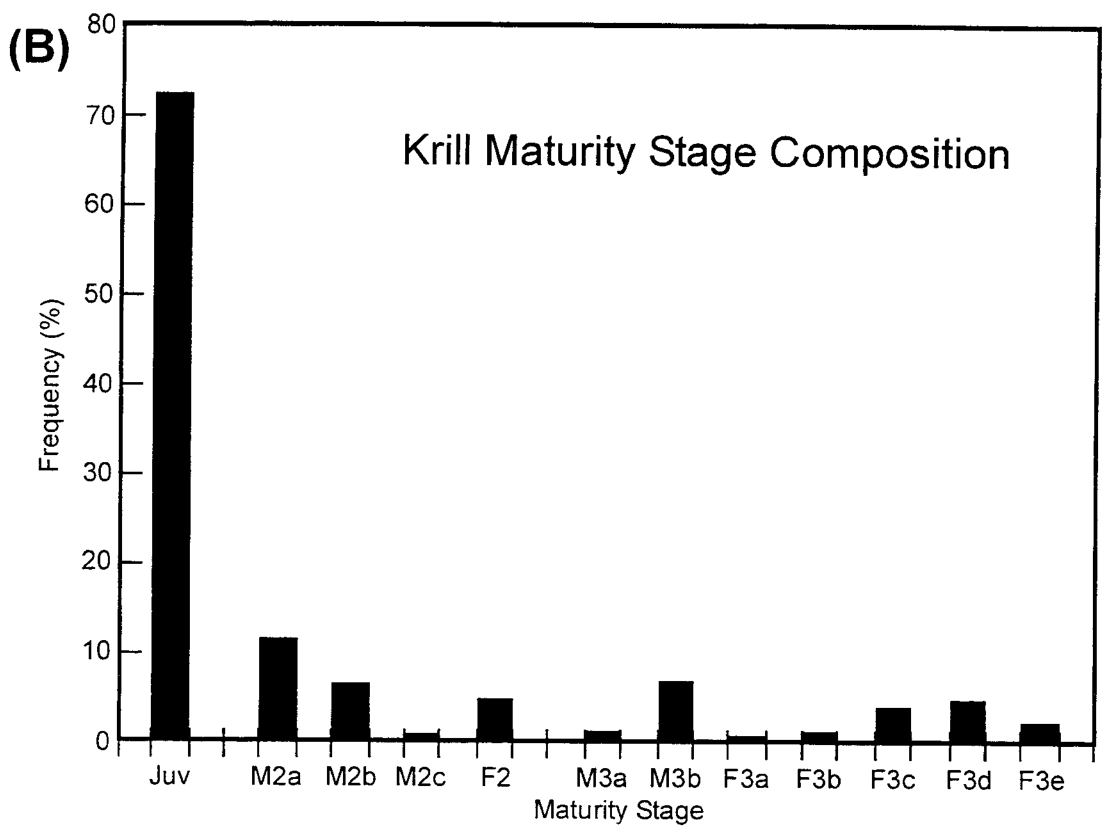


Figure 4.2 Krill (A) length-frequency distribution of krill and (B) maturity stage composition during Survey A.

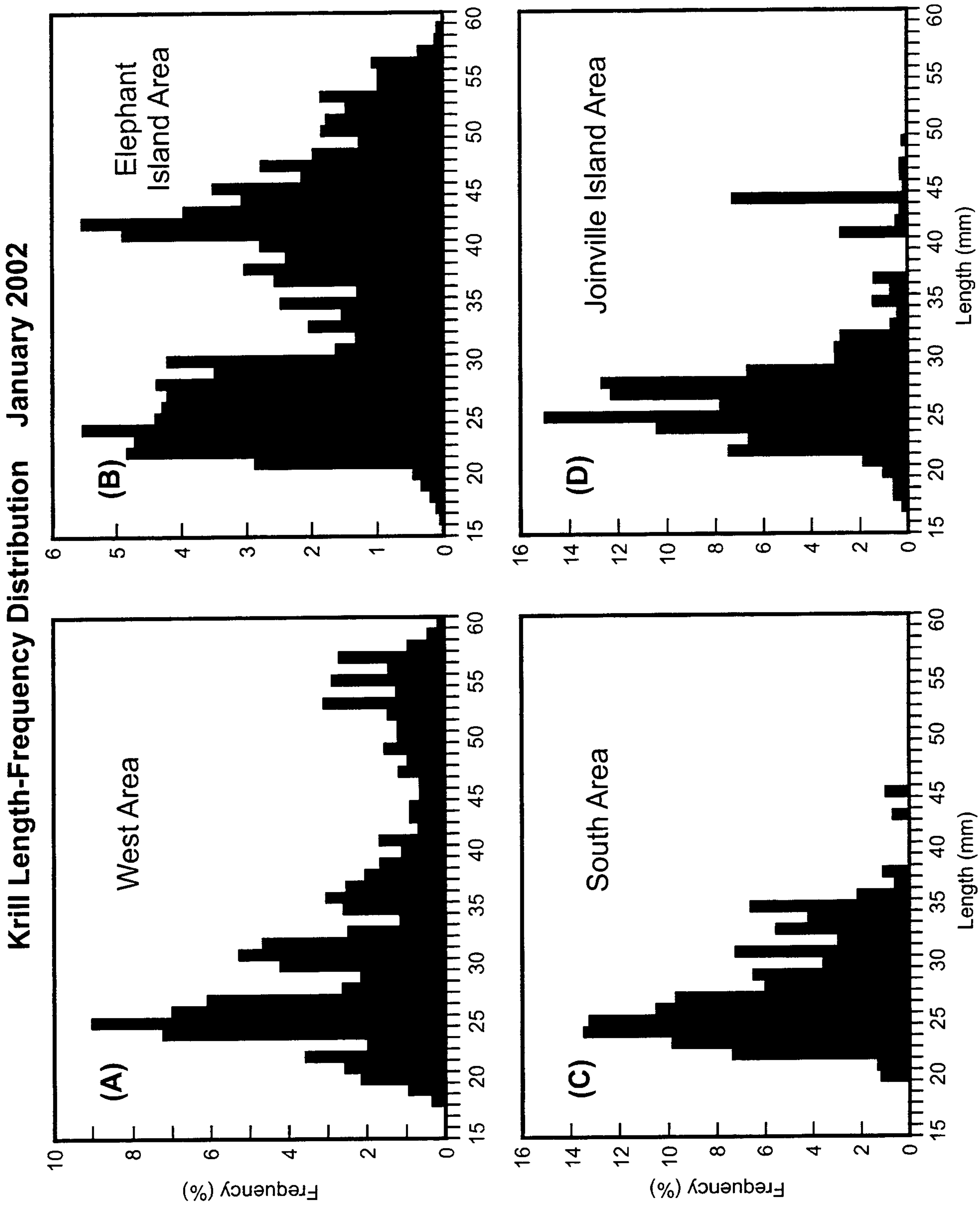


Figure 4.3. Length-frequency distribution of krill collected in the (A) West Area, (B) Elephant Island, (C) South and (D) Joinville Island Areas during Survey A.

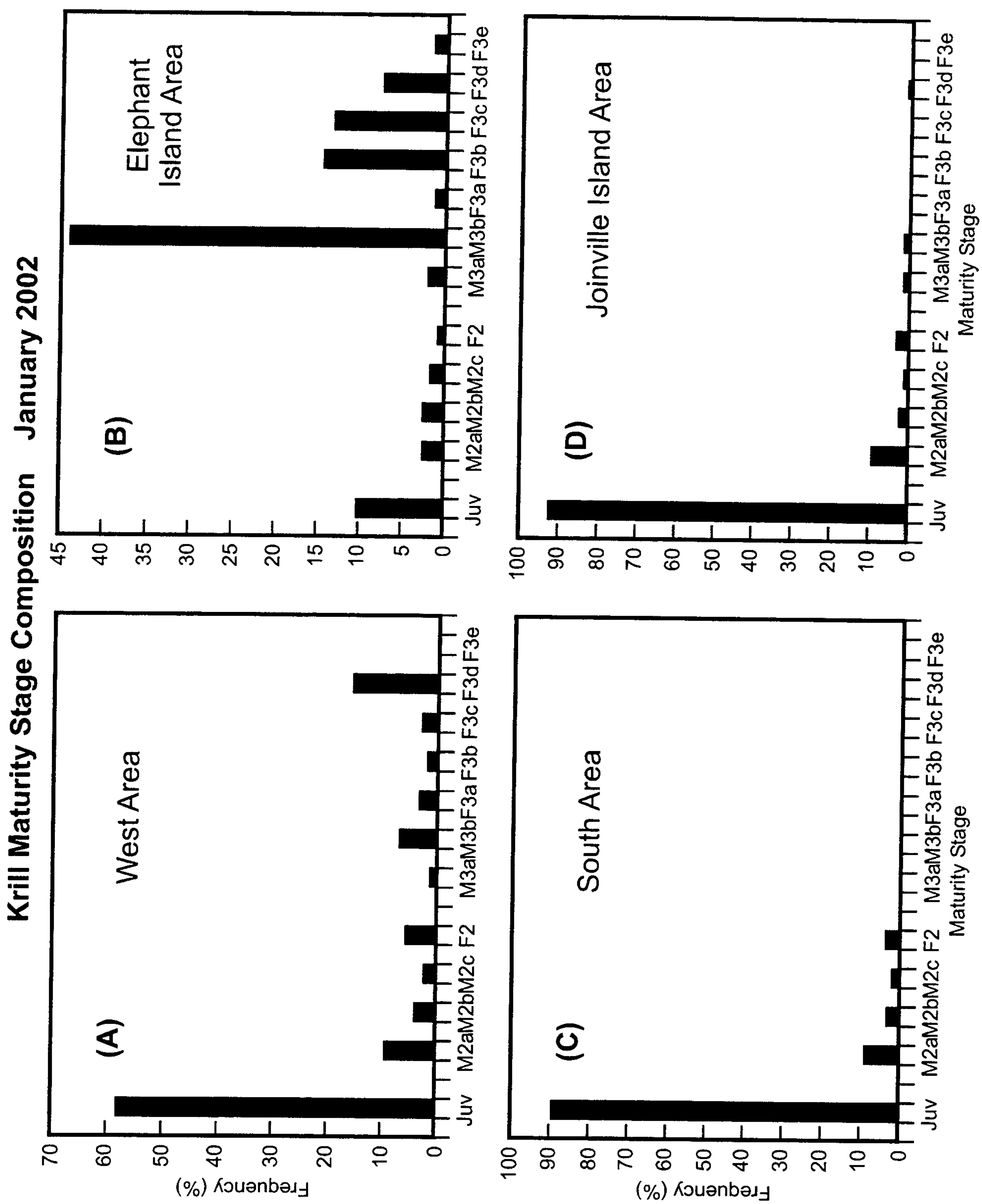


Figure 4.4. Maturity stage composition of krill collected in the (A) West Area, (B) Elephant Island, (C) South and (D) Joinville Island Areas during Survey A.

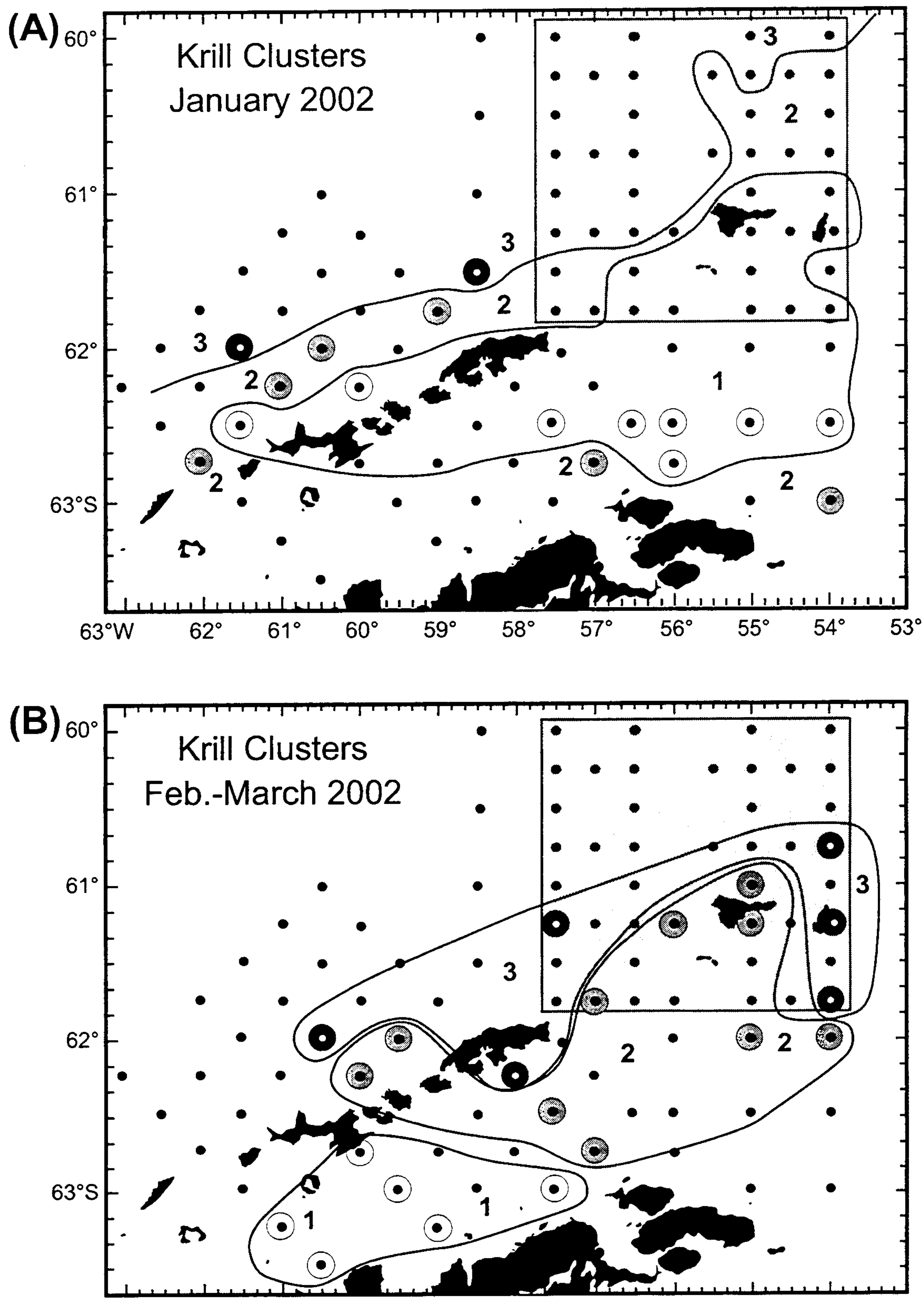


Figure 4.5. Distribution patterns of krill belonging to three length categories (Clusters) within the large survey areas during (A) January Survey A and (B) February-March Survey D.

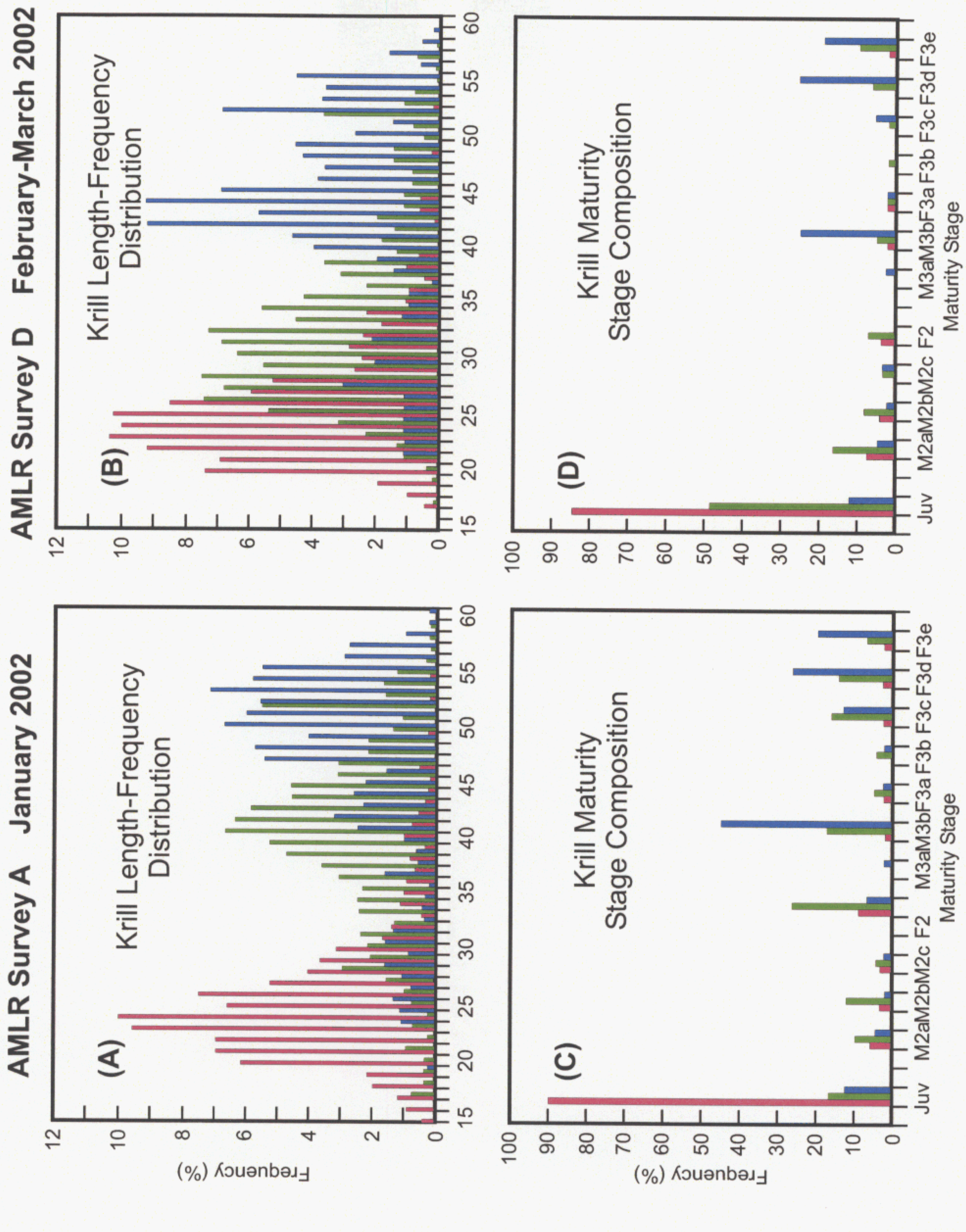


Figure 4.6. Length-frequency distribution and maturity stage composition of krill belonging to Clusters 1-3 during (A,B) Survey A and (C,D) Survey D.

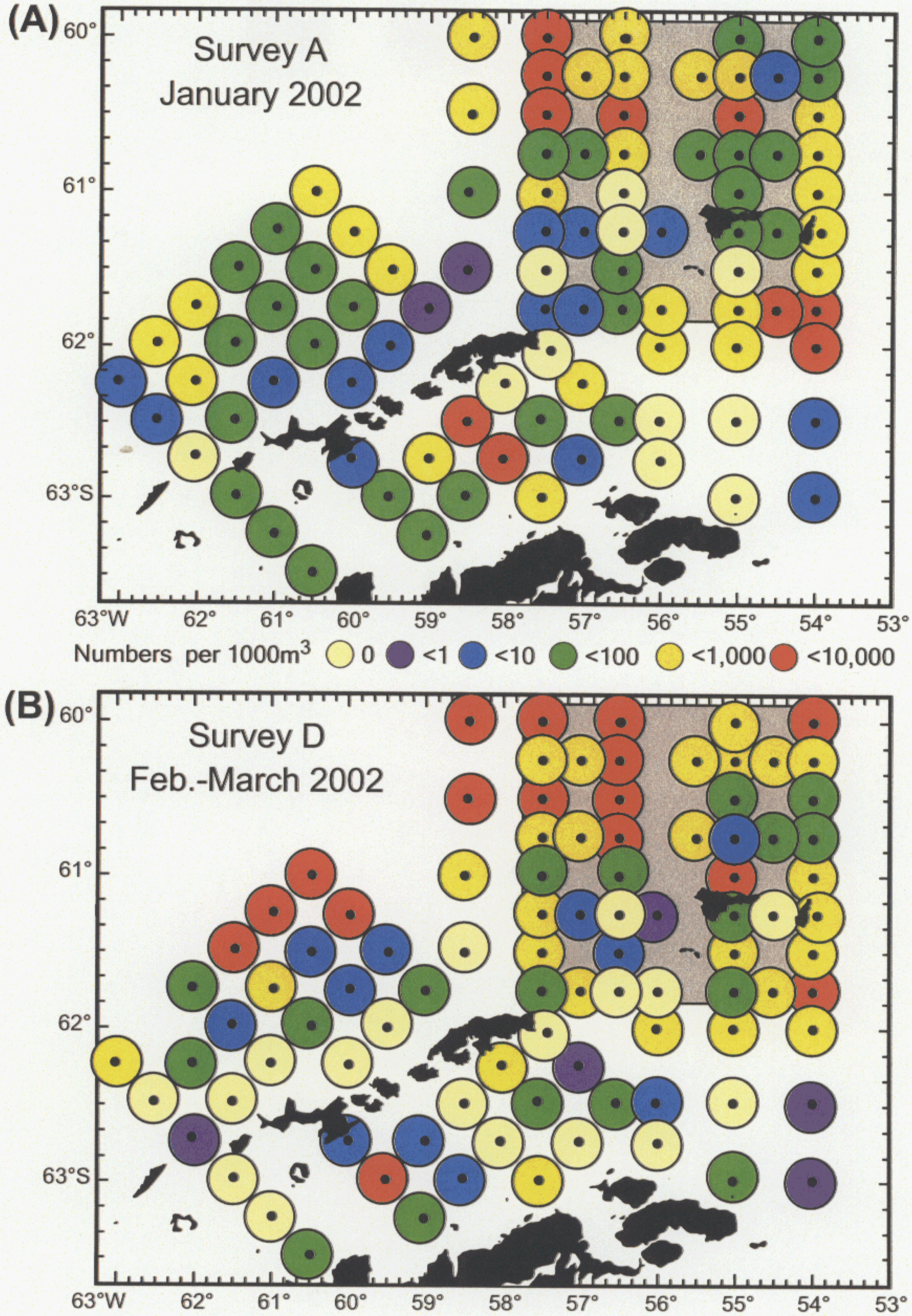


Figure 4.7. Distribution and abundance of *Salpa thompsoni* during (A) Survey A and (B) Survey D.

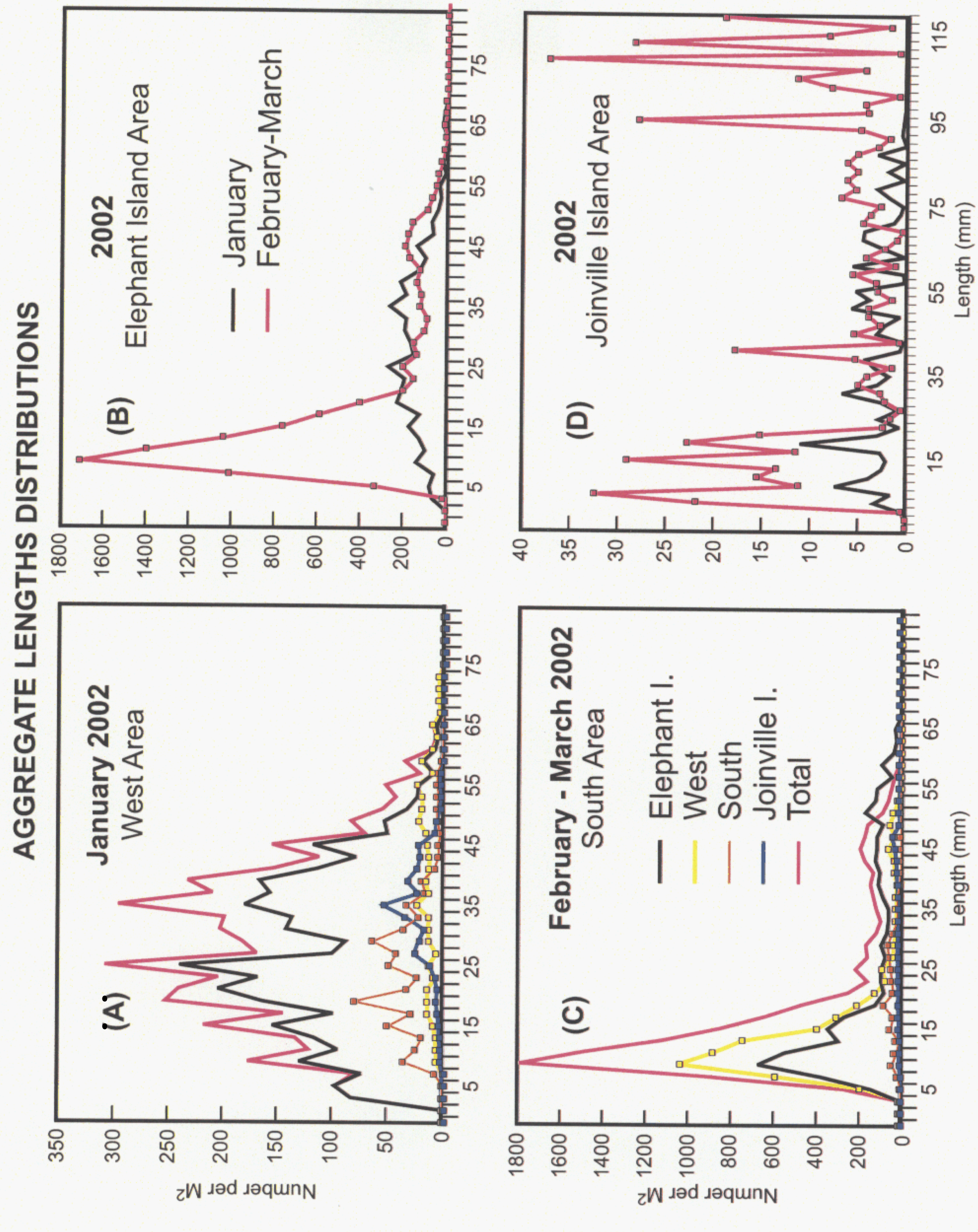


Figure 4.8. Length-frequency distributions of aggregate stage *Salpa thompsoni* in the large survey area and four subareas (A) January and, (B) February-March and seasonal differences in, (C) aggregate stage and (D) solitary stage length-frequency distributions, January-March 2002.

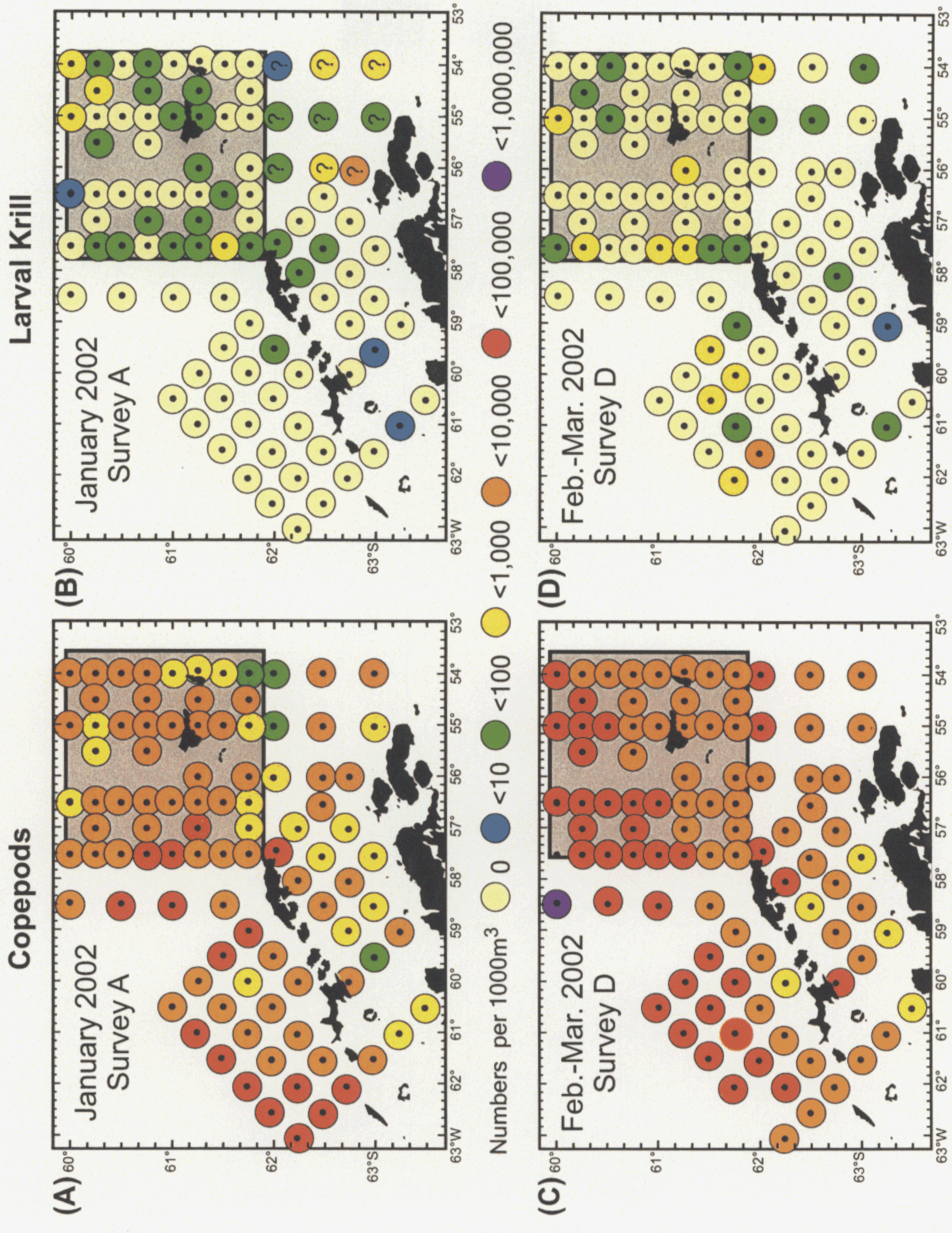


Figure 4.9. Distribution and abundance of copepods and larval krill in the (A,B) Survey A and (C,D) Survey D Areas.

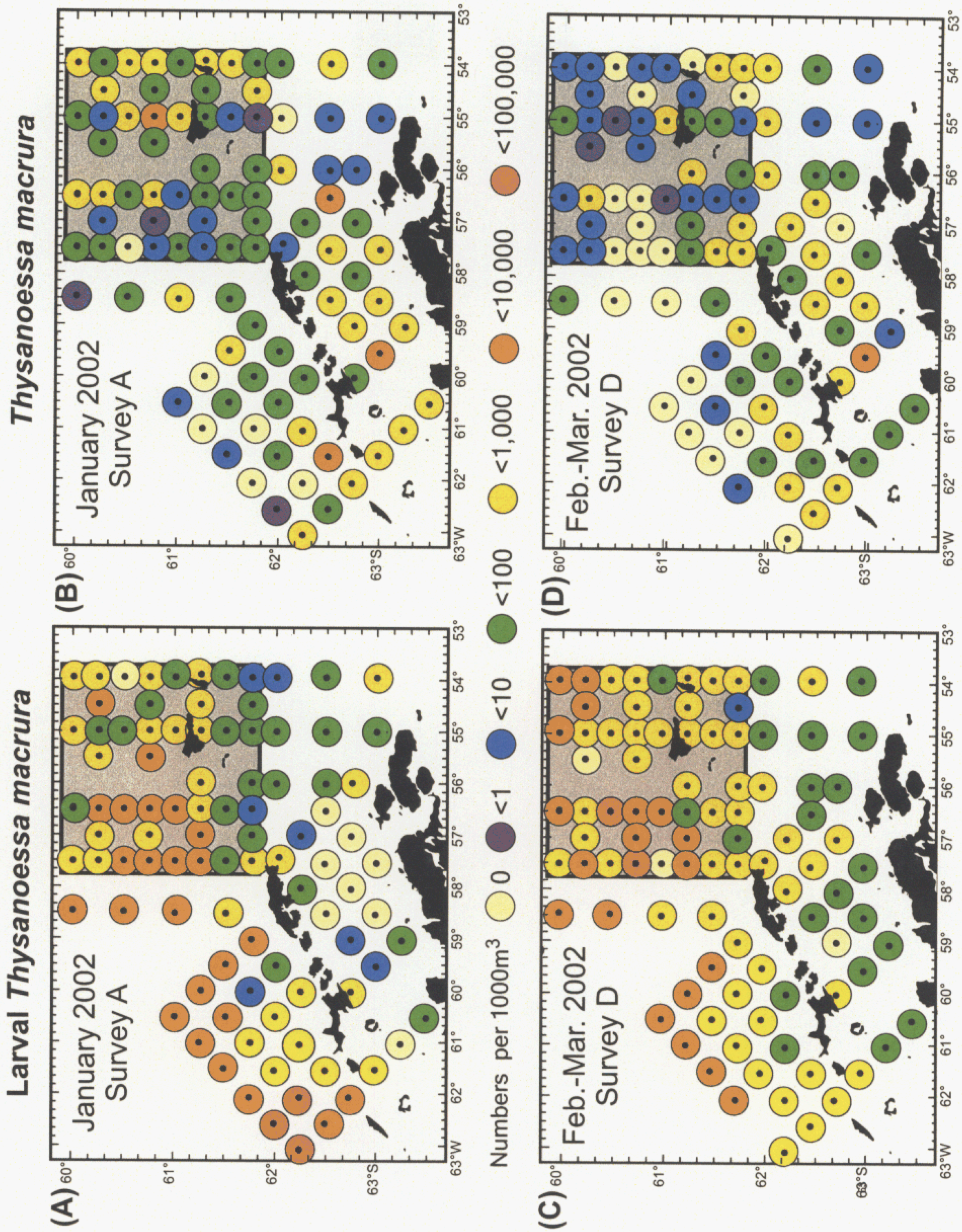
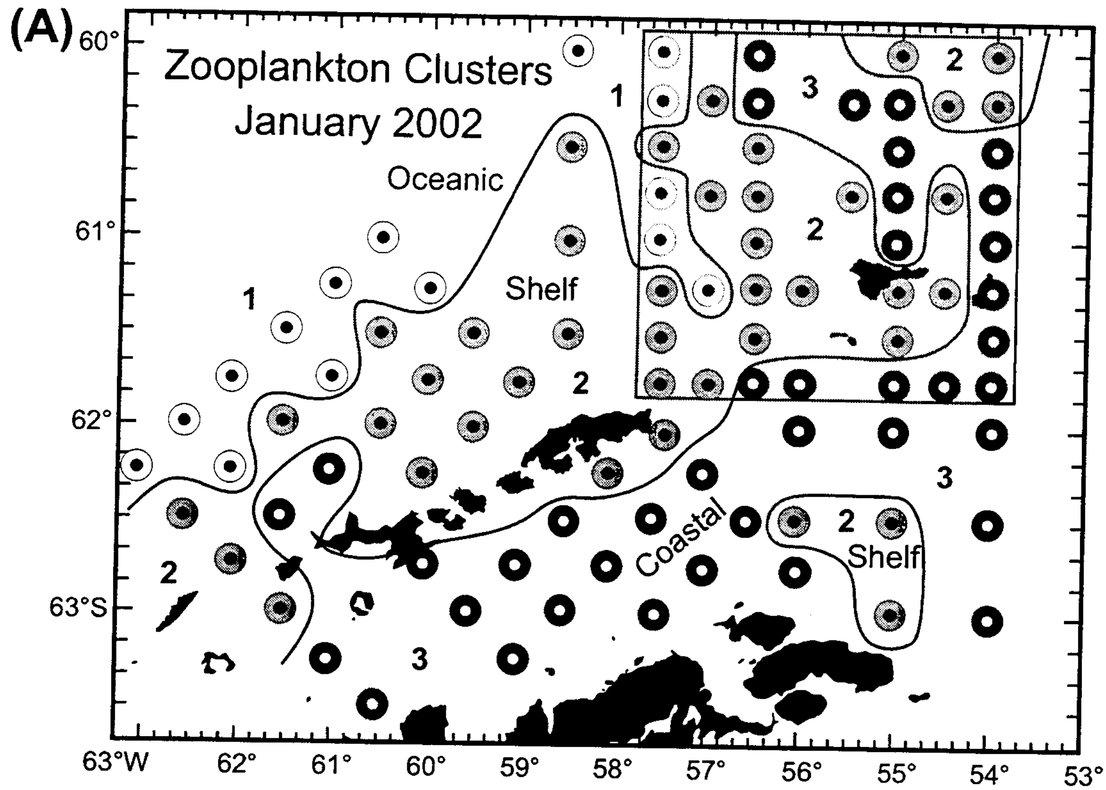


Figure 4.10. Distribution and abundance of larval and post larval *Thysanoessa macura* in the (A,B) Survey A and (C,D) Survey D Areas.



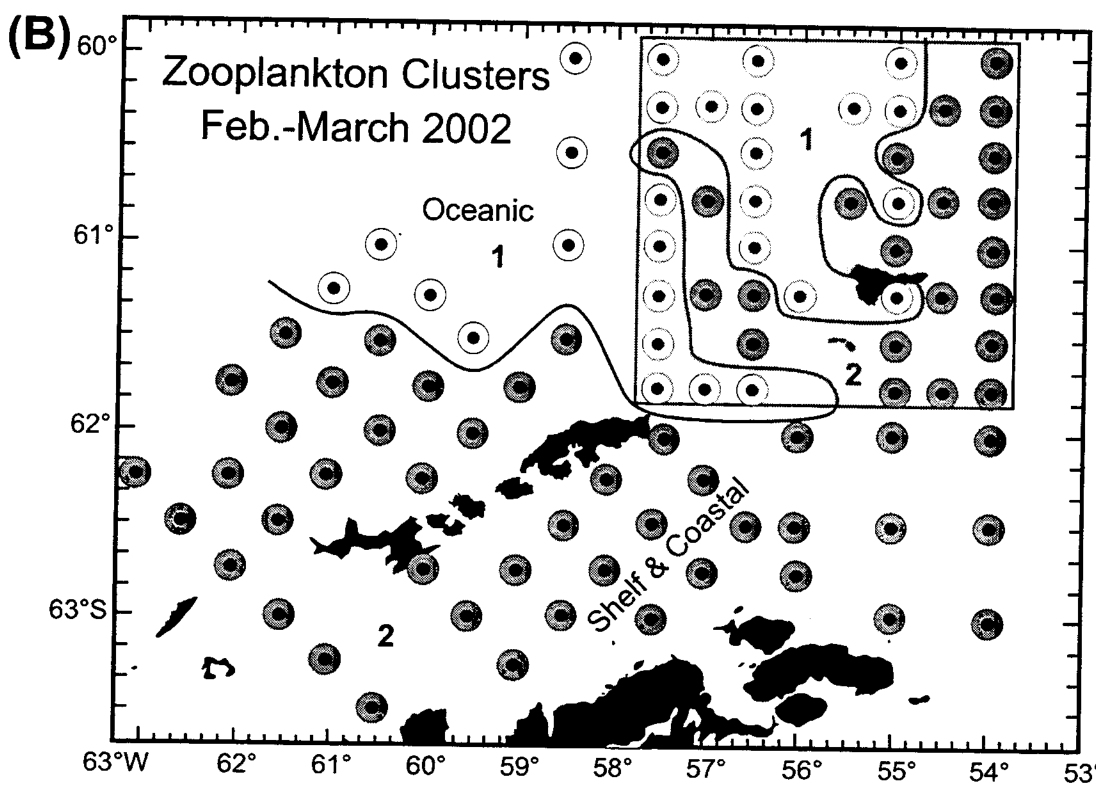
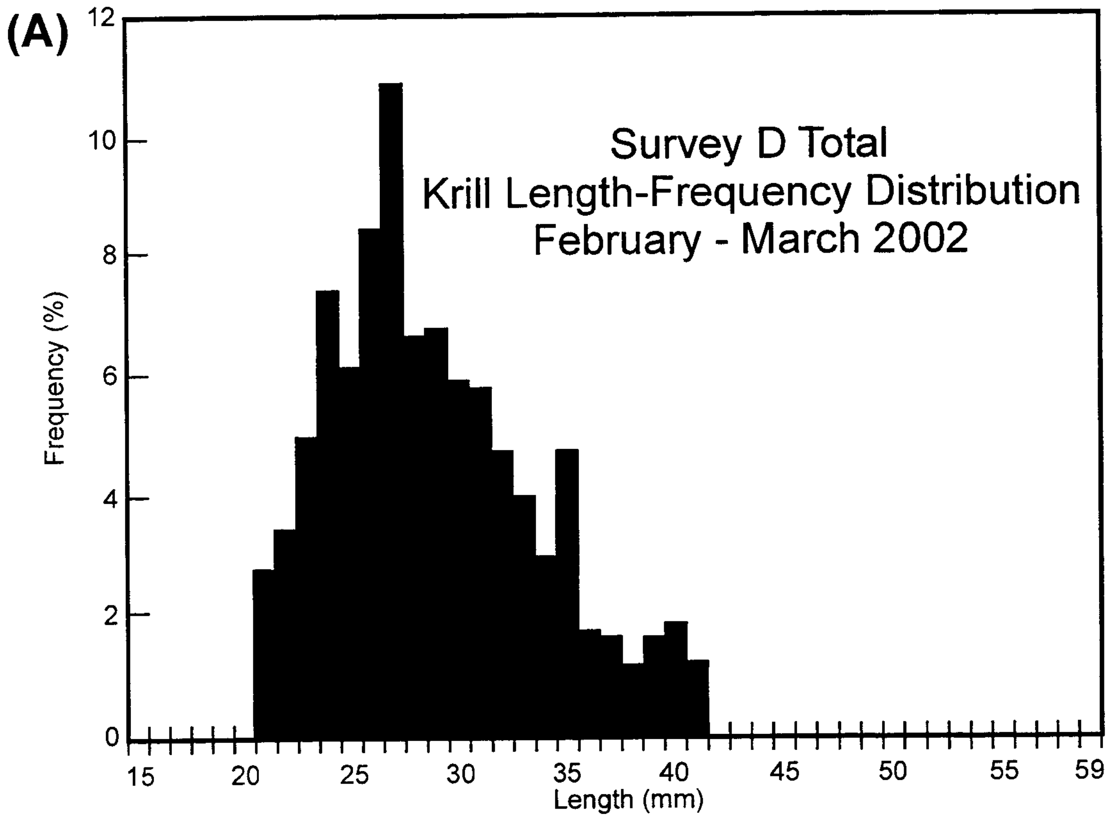


Figure 4.11. Distribution of three zooplankton assemblages (Clusters 1, 2 and 3) noted during the CCAMLR 2000 Survey. These roughly correspond to three "faunistic divisions" described by Mackintosh (1934): the eastern Scotia Sea (Cluster 1); Graham Land (Cluster 2); and transition belt (Cluster 3).



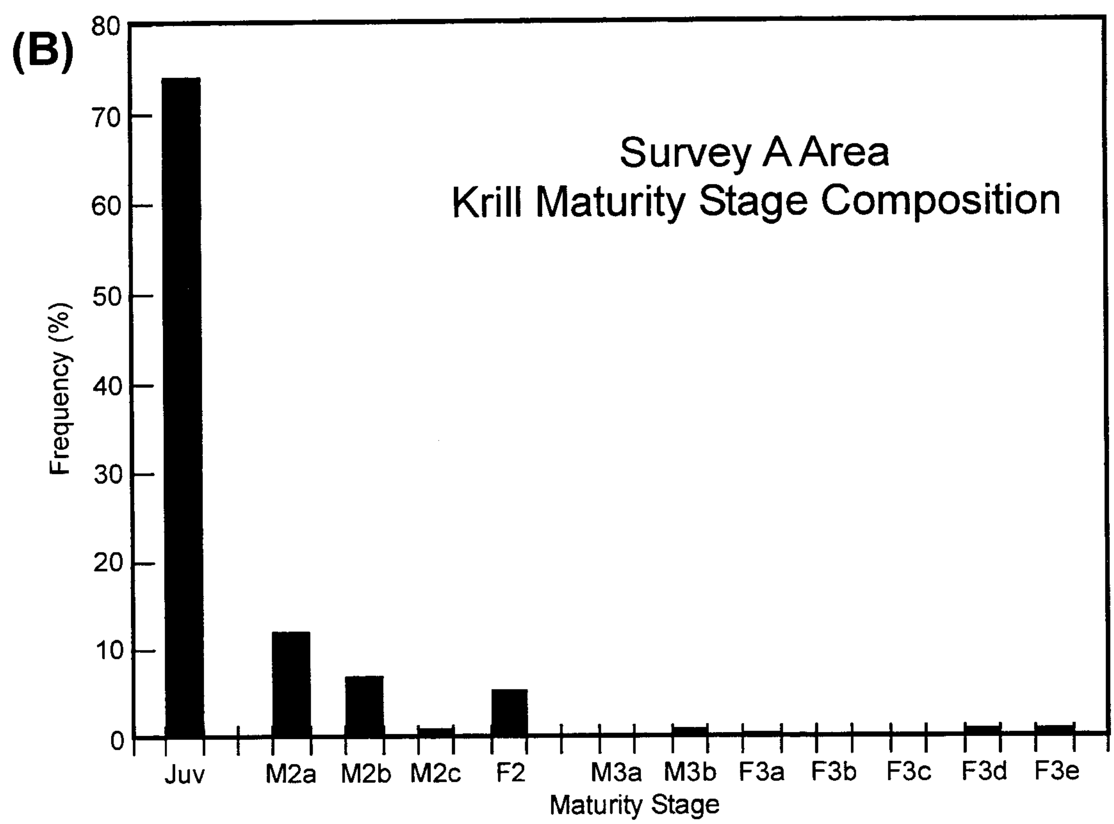


Figure 4.12. Krill (A) length-frequency distribution and (B) maturity stage composition during February-March Survey D.

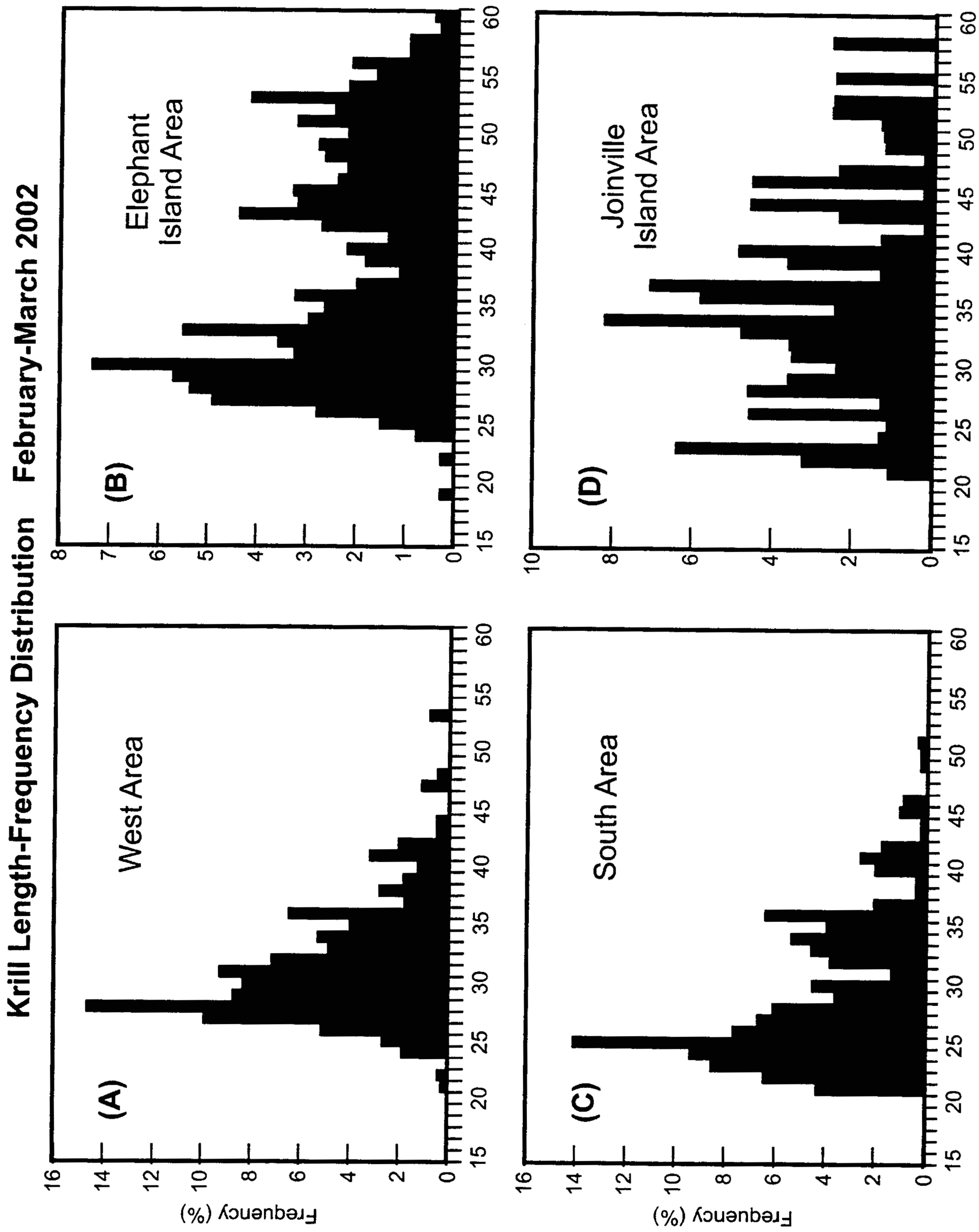


Figure 4.13. Length-frequency distribution of krill collected in the (A) West, (B) Elephant Island, (C) South and (D) Joinville Island Areas during February-March, 2002..

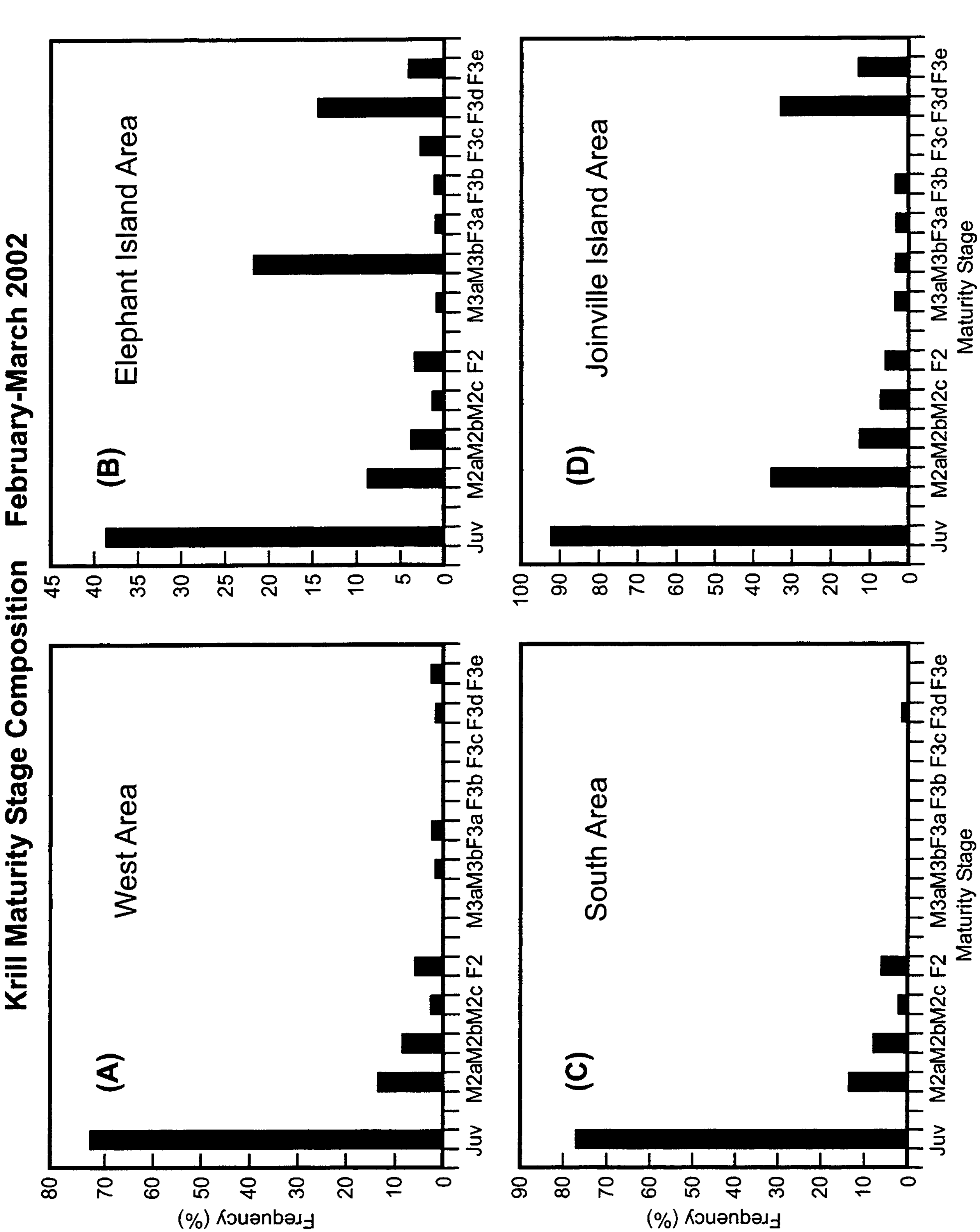


Figure 4.14. Maturity stage composition of krill collected in the (A) West Area, (B) Elephant Island, (C) South and (D) Joinville Island Areas February-March, 2002.

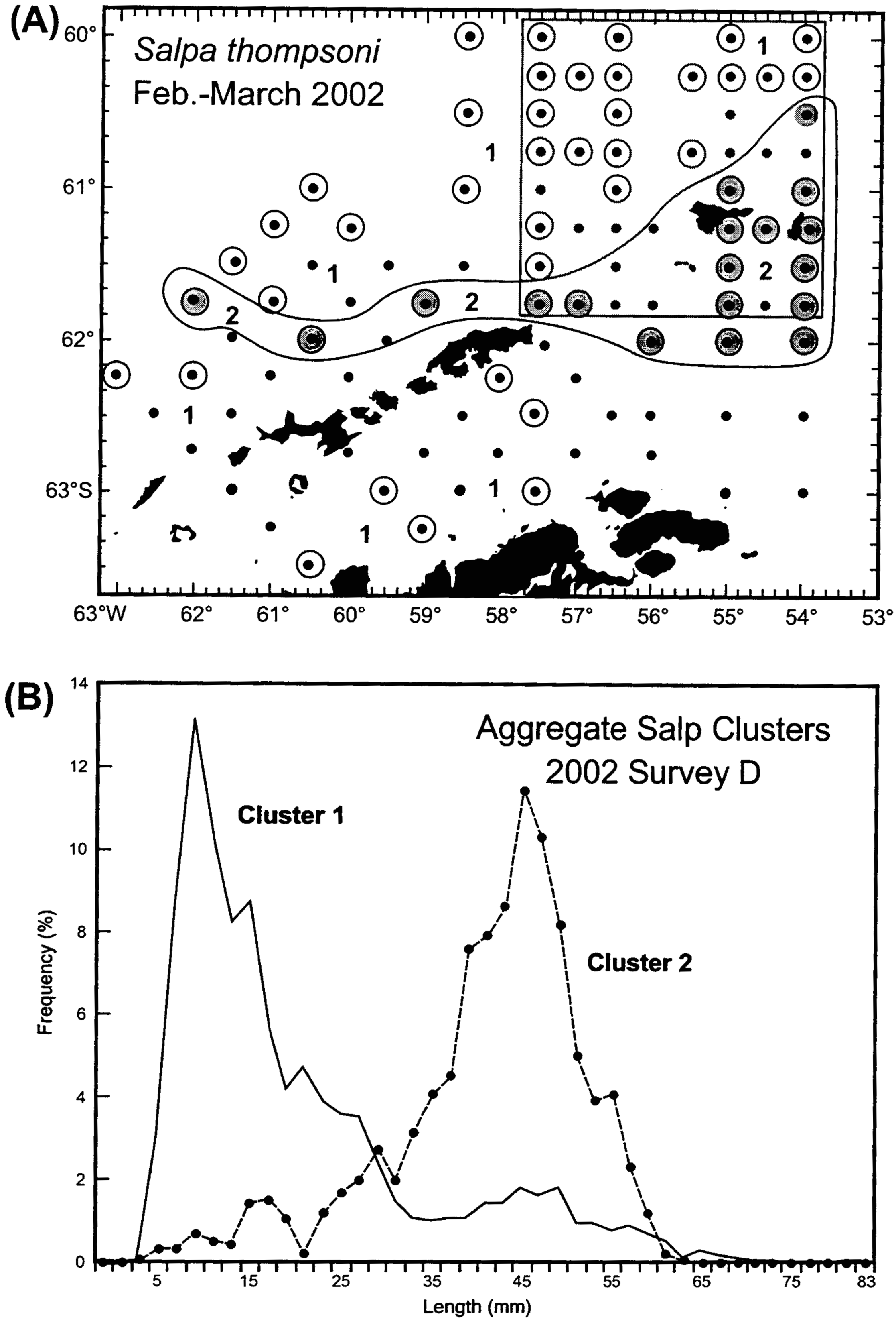


Figure 4.15. (A) Distribution and (B) length-frequency distribution of aggregate stage salps belonging to Clusters 1 and 2, February-March 2002.

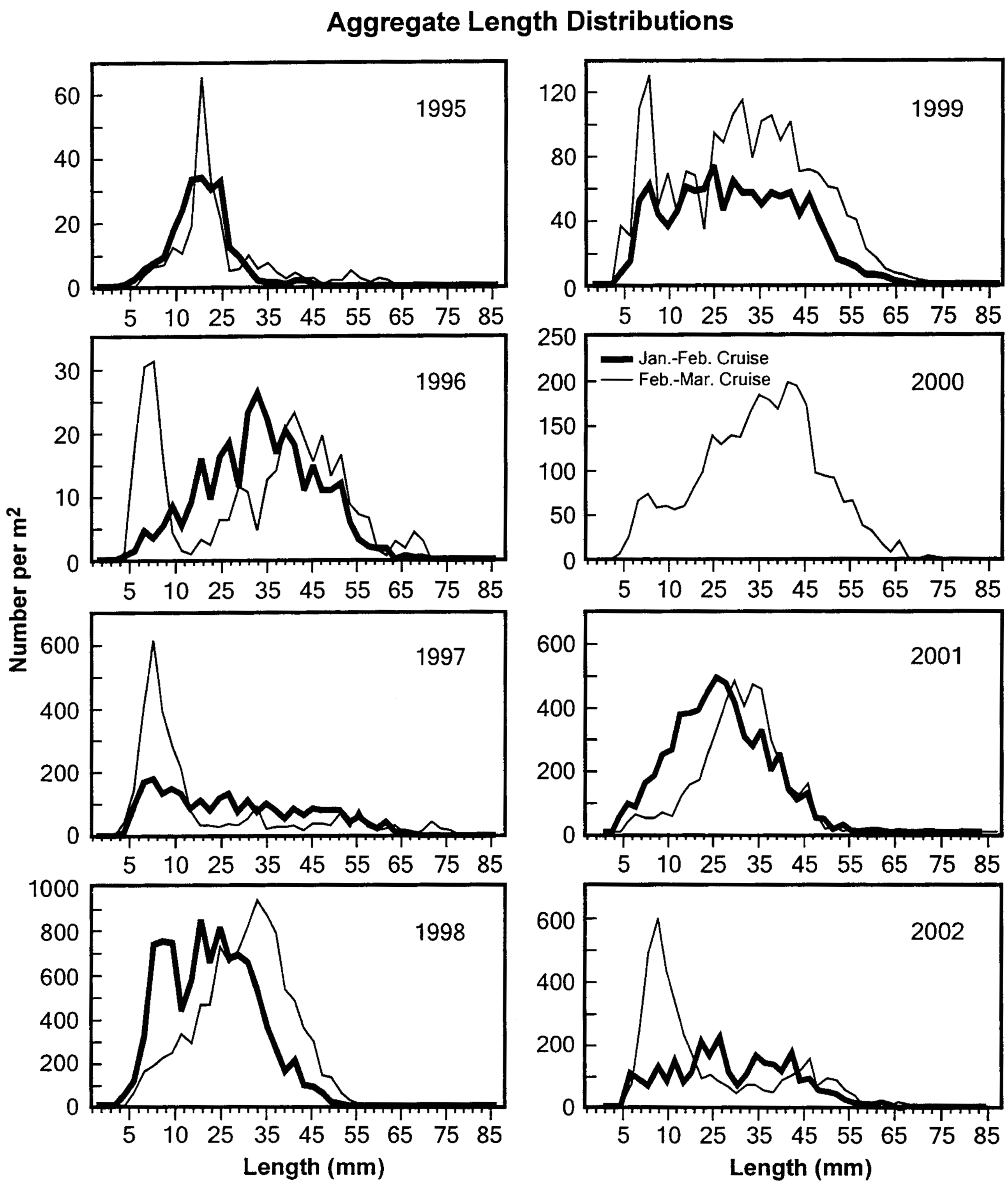


Figure 4.16. Salp length-frequency distribution during January-February and February-March, 1995-2002.